State Fisheries Committee
Russian Federation

Federal State Unitary Enterprise
Pacific Research Institute of Fishery and Oceanography
(FGUP TINRO-Center)

RESEARCH PROGRAM ANNUAL REPORT

Distribution, Abundance, and Movement Patterns of Western Gray Whales (*Eschrichtius robustus*) off the coast of Northeastern Sakhalin Island in June-December 2003 Based on Aerial Survey Data

Prepared by

S.A. Blokhin, N.V. Doroshenko, and S.B. Yazvenko

for

All-Russian Research Institute of Fisheries and Oceanography (VNIRO),
Exxon Neftegaz Limited (ENL) and
Sakhalin Energy Investment Company, Ltd.

Vladivostok – 2004

State Fisheries Committee
Russian Federation

Federal State Unitary Enterprise
Pacific Research Institute of Fishery and Oceanography
(FGUP TINRO-Center)

UDC 639.24.053.7:599.745

Inv. No. _____

APPROVED BY
Director of TINRO-Center
Doctor of Technical Sciences
_____ L.N. Bocharov
Date: _____ 2004

RESEARCH PROGRAM ANNUAL REPORT

Distribution, Abundance, and Movement Patterns of Western Gray Whales (*Eschrichtius robustus*) off the coast of Northeastern Sakhalin Island in June-December 2003 Based on Aerial Survey Data

Subject area 1.13

Team leader
Head of Laboratory
Candidate of Biological Sciences A.S. Perlov .

Team members:

Research Scientist S.A. Blokhin

Senior Research Scientist,
Candidate of Biological Sciences N.V. Doroshenko

Vladivostok – 2004

State Fisheries Committee
Russian Federation

Federal State Unitary Enterprise
Pacific Research Institute of Fishery and Oceanography
(FGUP TINRO-Center)

UDC 639.24.053.7:599.745

Inv. No. _____

APPROVED BY

Director of TINRO-Center
Doctor of Technical Sciences

_____ L.N. Bocharov

_____ 2004

RESEARCH PROGRAM ANNUAL REPORT

Distribution, Abundance, and Movement Patterns of Western Gray Whales (*Eschrichtius robustus*) off the coast of Northeastern Sakhalin Island in June-December 2003 Based on Aerial Survey Data

Subject area 1.13

Team leader
Head of Laboratory
Candidate of Biological Sciences A.S. Perlov

Vladivostok – 2004

Executive Summary

Keywords: gray whale, abundance, distribution, behavior, Piltun area, Offshore area, aerial survey, An-28, survey, movement, mud plumes, feeding.

Ten tables, 74 figures, 58 references, 2 appendices, 136 pp.

Aerial surveys of marine mammals off the northeast coast of Sakhalin Island were conducted in accordance with a contract between VNIRO and TINRO-Center. The main objective of this study was to determine the abundance, distribution and behavior of endangered western, or Korean-Okhotsk population of gray whales (*Eschrichtius robustus*) in this region. Overflights were conducted using a fixed-wing aircraft An-28 traveling ~180 km/hr along four transect grids covering the coastal waters of eastern Sakhalin between 51° N and 54° N at an altitude of 300 m ASL (Piltun grid) or 500 m ASL (Offshore, Lunskoye, and Extensive grids). A total of six sets of monthly surveys were conducted that comprised 47 separate surveys; and 126.5 flight hours logged, including 83.5 hrs of net survey time and 43 hrs of ferry time between survey grids and from/to the base. A total of 395 sightings of 532 individual marine mammals were recorded by all aerial observers in all survey areas. Of the total, there were 372 sightings of 492 individual gray whales (excluding mud/feeding plumes without associated gray whales). This number includes multiple resightings of the same animals and does not imply in any way the population size. All sighted gray whales were located within the two known feeding areas: Piltun area and Offshore area. The number of gray whales sighted per survey in these feeding areas varied during the entire survey period (early June through early December) from 0 to 27 in the Piltun area and from 0 to 9 in the Offshore area. The distribution of gray whales within the areas shifted throughout the season. The pattern of seasonal shifts in the Piltun area was first determined in 2001 and confirmed in 2002 and 2003: in August, the center of concentration of gray whales shifted to the southern portion of the feeding area, to about 52° 55’ N; in mid-September through November, the concentration of gray whales shifted towards the north, to about 53° 15’ N - 53° 20’ N.

In the Offshore area in 2003, the numbers of gray whales were somewhat lower than in 2002. Vessel-based observers sighted a large number of gray whales eastwards of the Offshore grid and thus outside the sight of aerial observers. This may explain the lower number of observed whales in the area in 2003.

Besides gray whales, 23 sightings of 40 other cetaceans were made, including minke whales (13 sightings of 18 animals), Baird’s beaked whales (1/2), killer whales (6/17), and unknown large whales (3/3).

TABLE OF CONTENTS

EXECUTIVE SUMMARY ..... **I**

LIST OF FIGURES ..... **IV**

LIST OF TABLES ..... **VIII**

ACKNOWLEDGEMENTS ..... **IX**

INTRODUCTION **1**

FIELD METHODS **3**

Survey Area 4
Intensive (Piltun Feeding Area) Survey Grid *4*
Offshore Feeding Area Survey Grid *5*
Extensive (Broad-Scale) Survey Grid *5*
Lunskoye Area Survey Grid *6*
Survey Design 7
Aerial Survey Personnel 8
Safety Procedures 8
Survey Procedures 8

DATA ANALYSIS **14**

Univariate analyses 14
Data types 14
Type 1 ..... *14*
Type 2 ..... *15*
Type 3 (Piltun area only) *15*
Mapping gray whale distribution 15
Mapping survey effort and gray whale densities 15
Mapping gray whale feeding 16

RESULTS **16**

Intensive (Piltun Feeding Area) Survey Grid 17
Gray whale abundance and distribution *18*
Survey effort and adjusted observed densities of gray whales *19*
Mother/calf pairs *20*
Group size and orientation/movement *20*
Gray whale feeding *20*
Other marine mammals *21*
Offshore Feeding Area Survey Grid 21
Gray whale abundance and distribution *21*
Survey effort and adjusted observed densities of gray whales *22*
Gray whale feeding *22*
Other marine mammals *23*
Extensive (Broad-Scale) Survey Grid 23

Lunskoye Area Survey Grid 23

DISCUSSION 23

Piltun Feeding Area 24
Gray whale distribution and abundance 24
Survey effort and adjusted observed densities of gray whales 27
Mother/calf pairs 27
Gray whale feeding 28
Offshore Feeding Area 29
Gray whale distribution and abundance 29
Gray whale feeding 30
Lunskoye grid area 32

CONCLUSIONS 33

REFERENCES 35

TABLES 43

FIGURES 54

APPENDIX 1 127

APPENDIX 2 134

LIST OF FIGURES

Figure 1. Aerial survey grids used for marine mammal aerial surveys off the NE coast of Sakhalin Island in June – December 2003. 55
Figure 2. Piltun Bay feeding area survey grid. 56
Figure 3. Offshore feeding area survey grid. 57
Figure 4. Lunskoye area survey grid. 58
Figure 5. Extensive survey grid 59
Figure 6. Map of Piltun Area (Figure 1) sectors: 1-44 -- mini-sectors; I-IV. – survey transect lines 60
Figure 8. Diagram of water view sectors of two observers in aerial surveys off the NE coast of Sakhalin (An-28) (% - inclinometer readings). 61
Figure 8. Distances from survey centerline (offsets) at which gray whales were sighted from the aircraft during aerial surveys of the Piltun Area in July-October 2003 (An-28, flight altitude 300 meters, all sightings, unassociated mud plumes excluded). 62
Figure 9. All sightings of gray whales in June-December 2003 over all survey grids. 63
Figure 11. Gray whale sightings in the Piltun area, all aerial surveys combined (June – December 2003, aircraft An-28, all sightings on and off transect, altitude 300 m ASL). 64
Figure 13. Gray whale sightings in the Piltun area, aerial surveys (July 2003, aircraft An-28, all sightings on and off transect, altitude 300 m ASL). 65
Figure 12. Gray whale sightings in the Piltun area, aerial surveys (August 2003, aircraft An-28, all sightings on and off transect, altitude 300 m ASL). 66
Figure 13. Gray whale sightings in the Piltun area, aerial surveys (September 2003, aircraft An-28, all sightings on and off transect, altitude 300 m ASL). 67
Figure 14. Gray whale sightings in the Piltun area, aerial surveys (October 2003, aircraft An-28, all sightings on and off transect, altitude 300 m ASL). 68
Figure 18. Gray whale sightings in the Piltun area, aerial surveys (29 November and 2 December 2003, aircraft An-28, all sightings on and off transect, altitude 300 m ASL). 69
Figure 16. Comparison of gray whale aerial survey sightings (all sightings, on and off transect) in and around Piltun feeding area in 1999-2003. Data for 1999-2002 from Sobolevsky (2000, 2001), Yazvenko *et al*. 2002, Blokhin *et al*. 2003. Survey techniques in 1999-2000 differed from later years. 70
Figure 21. Gray whale aerial observation survey data - Piltun Area (on-transect, lines 1 and 2) in 2003. 71
Figure 23. Monthly means of gray whale numbers in July-October 2003 (all Intensive surveys, transects 1 and 2, on-transect sightings). 72
Figure 19. Frequency of gray whale sightings at different distances from the shore - Piltun Area in July-October 2003 (clinometer reading 30-110%, all surveys, including partial surveys, vs. full surveys only). 73
Figure 26. The number of gray whales observed on an individual survey - Transects 1 and 2 (Piltun Area, July-October 2003, An-28, clinometer reading 30-110%, all surveys, including partial surveys). 74
Figure 28. Distances offshore of sightings of gray whales in Piltun area (on- and off-transect sightings). 75
Figure 30. Monthly dynamics of mean distances offshore in block 4 (northern part of Piltun area). All sightings. 76

Figure 25. Survey effort (kilometers traveled through each 2x3 km grid cell) in June 2003. Number of gray whales sighted within a cell is shown in the cell (on transect sightings only, all Intensive and Extensive surveys, including partial ones). 77
Figure 24. Survey effort (kilometers traveled through each 2x3 km grid cell), July 2003. Number of gray whales sighted within a cell is shown in the cell (on transect sightings only, all Intensive and Extensive surveys, including partial ones). 78
Figure 25. Survey effort (kilometers traveled through each 2x3 km grid cell), August 2003. Number of gray whales sighted within a cell is shown in the cell (on transect sightings only, all Intensive and Extensive surveys, including partial ones). 79
Figure 26. Survey effort (kilometers traveled through each 2x3 km grid cell), September 2003. Number of gray whales sighted within a cell is shown in the cell (on transect sightings only, all Intensive and Extensive surveys, including partial ones). 80
Figure 27. Survey effort (kilometers traveled through each 2x3 km grid cell), October 2003. Number of gray whales sighted within a cell is shown in the cell (on transect sightings only, all Intensive and Extensive surveys, including partial ones). 81
Figure 31. Survey effort (kilometers traveled through each 2x3 km grid cell), 29 November and 2 December, 2003. Number of gray whales sighted within a cell is shown in the cell (on transect sightings only, all Intensive and Extensive surveys, including partial ones). 82
Figure 33. Relative density of gray whales (number of whales seen per 1 km^2), July 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Intensive and Extensive surveys, including partial ones). 83
Figure 30. Relative density of gray whales (number of whales seen per 1 km^2), August 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Intensive surveys, including partial ones)..... 84
Figure 31. Relative density of gray whales (number of whales seen per 1 km^2), September 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Intensive and Extensive surveys, including partial ones). 85
Figure 32. Relative density of gray whales (number of whales seen per 1 km^2), October 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Intensive surveys, including partial ones)..... 86
Figure 38. Relative density of gray whales (number of whales seen per 1 km^2), 29 November and 2 December 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Intensive surveys, including partial ones)..... 87
Figure 34. Total monthly average observed numbers of gray whales in Piltun and in Offshore areas in 2003, based on relative densities (on-transect sightings, full and partial surveys).88
Figure 36. The number of on-transect observed gray whales per hour of aerial survey in the Offshore and Piltun areas, 2003..... 89
Figure 45. Distribution of gray whales along the shore in the Piltun area, July 2003, all Intensive survey, on- and off-transect sightings..... 90
Figure 47. Monthly distribution of gray whales along the shore in the Piltun area by sectors in July – October 2003, all Intensive survey, on- and off-transect sightings..... 91
Figure 49. Monthly distribution of gray whales along the shore in the Piltun area by 2-km mini-sectors (Figure 6) in July – October 2003, all Intensive survey, on- and off-transect sightings. North is on the right..... 92
Figure 41. Group size among gray whales in Piltun area in July – October 2003, Intensive survey, on-transect sightings..... 93

Figure 43. Directional orientation of observed gray whales in Piltun area in July – October 2003 by the time of the day, month (stage) and sector (all Intensive survey, on- and off-transect sightings). 93
Figure 45. Proportion of observed gray whales in Piltun area oriented north in July – November 2003 by month (stage) (all Intensive survey, on- and off-transect sightings). The table shows that the differences in pairs August-September and August-October are statistically significant. 94
Figure 47. Proportion of observed gray whales in Piltun area oriented north in July – October 2003 by sector (all Intensive survey, on- and off-transect sightings). The table shows that the differences in pairs Sector 2 – Sector 4 and Sector 2 – Sector 5 are statistically significant. 95
Figure 49. Proportion of observed gray whales in Piltun area oriented north in July – October 2003 by the time of the day (all Intensive survey, on- and off-transect sightings). No statistically significant differences in orientation were found. 96
Figure 51. Feeding index of gray whales observed in Piltun area, July – October 2003 (all Intensive surveys, on-transect sightings). 97
Figure 53. Feeding index of gray whales observed in Piltun area in 2003 by sectors (all Intensive surveys, on-transect sightings). 98
Figure 55. All gray whale sightings in the Offshore Area in June-December 2003 (all Offshore and Extensive grid aerial surveys, aircraft An-28, on- and off-transect sightings, 500 m ASL). 99
Figure 47. Gray whale sightings in the Offshore Area on 8 July 2003 (Offshore grid aerial survey, aircraft An-28, on- and off-transect sightings, 500 m ASL). Only lines flown are displayed. 100
Figure 48. Gray whale sightings in the Offshore Area on 15 July 2003 (Offshore grid aerial survey, aircraft An-28, on- and off-transect sightings, 500 m ASL). Only lines flown are displayed. 101
Figure 49. Gray whale sightings in the Offshore Area on 20 August 2003 (Offshore grid aerial survey, aircraft An-28, on- and off-transect sightings, 500 m ASL). Only lines flown are displayed. 102
Figure 50. Gray whale sightings in the Offshore Area on 18 September 2003 (Offshore grid aerial survey, aircraft An-28, on- and off-transect sightings, 500 m ASL). Only lines flown are displayed. 103
Figure 51. Gray whale sightings in the Offshore Area on 21, 28 October 2003 (Offshore grid aerial survey, aircraft An-28, on- and off-transect sightings, 500 m ASL). Only lines flown are displayed. 104
Figure 53. Gray whale sightings in the Offshore Area on 29 November and 2 December 2003 (Offshore grid aerial survey, aircraft An-28, on- and off-transect sightings, 500 m ASL). Only lines flown are displayed. 105
Figure 63. On-transect gray whales sighted during the Offshore grid aerial surveys in 2003. Near-full surveys (7-9 lines) are indicated by (*). 106
Figure 65. Latitudinal distribution, on- and off-transect gray whales sighted during the Offshore grid aerial surveys in 2003. 106
Figure 67. Group sizes of gray whales in the Offshore area in 2003 (on-transect sightings). 107
Figure 69. Directional orientation of gray whales sighted on-transect in the Offshore grid aerial surveys in 2003. 107

Figure 59. Feeding index of gray whales in the Offshore area in 2003 broken down by month (Phases, or sets of aerial surveys), Offshore grid surveys, on-transect sightings. 108
Figure 61. Average number of gray whales observed on individual surveys in August-October of 2002 vs. 2003 (on-transect sightings only). 109
Figure 65. Relative density of gray whales in the Offshore area (number of whales seen per 1 km^2), June 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Offshore grid surveys, including partial ones). 110
Figure 60. . Relative density of gray whales in the Offshore area (number of whales seen per 1 km^2), July 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Offshore grid surveys, including partial ones, and Extensive survey).111
Figure 61. Relative density of gray whales in the Offshore area (number of whales seen per 1 km^2), August 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Offshore grid surveys, including partial ones). 112
Figure 62. Relative density of gray whales in the Offshore area (number of whales seen per 1 km^2), September 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Offshore grid surveys, including partial ones, and an Extensive grid survey). 113
Figure 63. Relative density of gray whales in the Offshore area (number of whales seen per 1 km^2), October 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Offshore grid surveys, including partial ones). 114
Figure 64. Relative density of gray whales in the Offshore area (number of whales seen per 1 km^2), November 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only). 115
Figure 72. Relative density of gray whales in the Offshore area (number of whales seen per 1 km^2), December 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only). 116
Figure 68. Gray whale feeding activity in the Piltun area in July-October 2001-2003 (Intensive surveys, on-transect sightings). 117
Figure 67. Average number of gray whales sighted per survey in the Offshore area in July-September 2002 vs. 2003 (on-transect sightings, Offshore grid surveys). 118
Figure 68. Latitudinal distribution of gray whales in the Offshore feeding area in 2001-2003 (all data, on- and off-transect sightings)..... 119
Figure 70. Locations of gray whales with feeding plumes (red circles) observed in the Offshore area on July – October 2003 aerial surveys with locations of benthic samples collected at whale feeding points (stars) in August – September 2003 by researchers onboard the Nevelskoy. Gray dots are 2001 aerial survey sightings of gray whales (Data on feeding points courtesy V.A. Fadeev)..... 120
Figure 70. Gray whales feeding indices in the Offshore area in July – November 2002 (on-transect sightings). 121
Figure 72. Gray whales feeding indices in the Offshore area in July – September: 2002 vs. 2003 (on-transect sightings)..... 122
Figure 75. Mean number of observed gray whales in July-October 2003 in the Piltun and the Offshore areas (on-transect sightings, Piltun grid and Offshore grid, resp.) 123
Figure 74. Feeding activity of gray whales in July-October 2003 in the Piltun and the Offshore areas (on-transect sightings, Piltun grid and Offshore grid, resp.) 124

Figure 76. Other cetaceans observed on aerial surveys in June-December 2003. Number of whales if >1 are shown beside symbols (on- and off-transect sightings, all grids). 125

LIST OF TABLES

Table 1. Grid points in Piltun grid 44
Table 2. Grid points in Offshore grid..... 44
Table 3. Grid points in the Lunskoye area grid 45
Table 4. Grid points in the Extensive survey grid 46
Table 6. Information recorded by observers during aerial surveys in all survey grids, 2001... 47
Table 7. Summary table of aerial surveys along the coast of NE Sakhalin in 2003 48
Table 9. Summary of time spent on conducting aerial surveys off the northeast coast of Sakhalin in 2003 50
Table 8. Number of gray whales observed on-transect in Piltun area in 2003 51
Table 10. Number of gray whales observed on-transect in Offshore area in 2003 52
Table 13. Locations of sighted whales other than gray whales, aerial survey data, 2003. 53

Please cite this report as follows:

Blokhin S.A., Doroshenko N.V. and Yazvenko S.B.. 2004. Distribution, Abundance, and Movement Patterns of Western Gray Whales (*Eschrichtius robustus*) in Coastal Waters of Northeastern Sakhalin Island, Russia, in June-December 2003 Based on Aerial Survey Data. Report by TINRO-Centre, Vladivostok, for VNIRO, Moscow, Russia. 136 p + Append

ACKNOWLEDGEMENTS

Stephen R. Johnson (LGL Limited) provided assistance in survey design, organization, and valuable consultations. Aleksandr A. Pustovoi, the chief pilot of the Vostok Air aircraft An-28, is thanked for his professionalism and organization of safe flights on Sakhalin under various weather conditions. Peter Wainwright (LGL) developed the method of mapping densities and survey effort. Robin Tamasi (LGL) prepared the maps. Valery Fadeev (IBM FEB RAN) provided the 2003 data on feeding points of gray whales. Lisanne Aerts (SEIC), Rodger Melton (ExxonMobil), Stephen R. Johnson (LGL), Sonya K. Meier (LGL) and Valery Vladimirov (VNIRO), provided critical comments, which significantly improved the text.

This study was financed jointly by Exxon Neftegas Limited (ENL) and Sakhalin Energy Investment Company Limited (SEIC).

INTRODUCTION

Several species of cetaceans have been observed in coastal waters of northeastern Sakhalin Island (Perlov *et al*. 1996). Of those, four species are considered rare or endangered by Russian Federation (Red Book of the Russian Federation 2001) and IUCN (Hilton-Taylor 2000): Western Pacific, or western, or Korean-Okhotsk, gray whale (*Eschrichtius robustus*), bowhead whale (*Balaena mysticetus*), North Pacific right whale (*Eubalaena glacialis*), and fin whale (*Balaenoptera physalus*). However, whereas bowhead whales, right whales and fin whales have been seen in the area occasionally, for the Western Pacific gray whales the area along the coast of northeastern Sakhalin represents the only known feeding grounds. Since 1997, there has been a significant increase in interest in the Western Pacific population of gray whales, both in Russia and abroad. The interest in this population of gray whales is due to two reasons. First, summer feeding areas of gray whales are in close vicinity to some of the major oil and gas fields on the shelf of eastern Sakhalin, including the Sakhalin Energy Investment Company (SEIC) Molikpaq platform and the planned development of oil and gas fields seaward of the Piltun and Chayvo bays. Second, this population is considered critically endangered, because only an estimated ~100 whales summer near NE Sakhalin, less than 50 adults are thought reproductively active (Weller *et al*. 2001) and the population is genetically distinct (LeDuc *et al*. 2002). Therefore, western gray whales are listed in the IUCN Red List (Hilton-Taylor 2000) and Russian Red Book (Red Book of the Russian Federation 2001).

By the mid-1960's, most researchers believed that western gray whales had gone extinct. However, in the early 1970's, gray whales began to be seen off Northeastern Sakhalin (Berzin 1974, Brownell and Chun 1977). On 10 September 1983, a TINRO scientist, G.M. Kosygin, observed ~20 gray whales feeding within 1.5 km of shore in the vicinity of Piltun Bay (Blokhin *et al*. 1985). From 1984 on, TINRO-Center has studied the western population of gray whales in the vicinity of NE Sakhalin Island. TINRO aerial surveys were conducted by helicopter MI-8 every season from 1984 up to 1991; their results were summarized by Berzin *et al*. (1990) and V.L. Vladimirov (1994). Between 1983-2002, aerial, vessel-based, and/or land-based surveys examined both the regional and local distribution and abundance of gray whales in this region of the Sea of Okhotsk (Blokhin *et al.* 1985, Berzin *et al*. 1990, Vladimirov 1994, Blokhin 1996, Blokhin *et al.* 1999, Blokhin and Burdin 2001, Sobolevsky 2002, Blokhin *et al.* 2002, Maminov

and Yakovlev 2002, Yazvenko *et al.* 2002, Weller *et al.* 1999, Weller *et al.* 2002, Blokhin *et al*. 2003, Weller *et al.* 2003). It was found that the majority of gray whales are distributed in two regions: (1) a shallow (<20 m deep) coastal zone adjacent to Piltun Bay and named "Piltun feeding area" (between 52°40' and 53°30' N); and (2) an area 20–40 km off the coast at about the latitude of the Chayvo and Nyjskiy bays (between 51°50' and 53°30' N) at depths of 35–65 m. The latter area named "Offshore feeding area" was found during the intensive monitoring studies associated with a 3-D seismic survey conducted in 2001 near the Piltun area that were financed by Exxon Neftegas Limited (ENL) (Maminov and Yakovlev 2002, Perlov *et al.* 2002, Yazvenko *et al.* 2002).

In the Offshore area, gray whales (five individuals) were first noted on 21 July 1995 (Sobolevsky 1998). After that, gray whales were observed in this area a few more times. Three gray whales were sighted on 3 October 1998 (Naberezhnykh 2001, *pers. comm*.); one gray whale was seen during an aerial survey on 23 June 2000 (Sobolevsky 2001) and eight gray whales were seen from a research vessel on 8 August 2000 (Miyashita *et al*. 2001). Unfortunately, specialists paid little attention to these sightings at that time. It was only after seven gray whales were sighted by M.K. Maminov in approximately the same place on 10 September 2001 from the vessel *Rubin* (Maminov and Yakovlev 2002) that more attention was turned to this area. Aerial surveys conducted immediately after that confirmed the presence of a large number of gray whales in these waters. An aerial survey conducted the next day, on 11 September 2001, confirmed the presence of gray whales in this area (Yazvenko *et al.* 2002). Before the end of 2001, four vessel-based surveys (Perlov *et al*. 2002) and 22 aerial surveys (Yazvenko *et al*. 2002) of this area were conducted. Gray whales in this area were observed in 2001 until mid-November (the end of surveys), and the largest number of them (83) was counted from the vessel on 17 September (Maminov and Yakovlev 2002) and from the air (34) on 12 October (Blokhin *et al*. 2002, Yazvenko *et al*. 2002). The presence of feeding mud plumes near gray whales in 2001 indicated that many were feeding on benthic organisms. Thus, aerial and vessel-based surveys in 2001 documented a second important feeding area for gray whales in offshore waters of northeastern Sakhalin Island, in which many gray whales were feeding and which is now believed to be as important as the Piltun area (Maminov and Yakovlev 2002; Blokhin *et al*. 2002, Yazvenko *et al*. 2002, Blokhin *et al*. 2003, Perlov and Maminov 2003; Maminov 2004).

Aerial and vessel-based surveys in 2002 established that the Offshore feeding area was a major feeding habitat for gray whales during the entire summer-fall period (Blokhin *et al*. 2003, Perlov and Maminov 2003).

The general objective of the aerial survey studies in 2003 was to monitor the temporal and spatial distribution of gray whales and their relative abundance in the coastal waters of northeast Sakhalin. The specific objectives included:

1. Monitoring the numbers and distribution of gray whales in the Piltun feeding area and the Offshore feeding area;
2. Monitoring the feeding intensity of gray whales on the feeding grounds;
3. Monitoring broad regional distribution of gray whales for any signs of changes in usual patterns of distribution and abundance; and
4. Collecting the data on other marine mammals in the area, with particular attention to other rare and endangered species.

This work fulfilled the objectives of aerial surveys that were proposed by the Sakhalin Energy Investment Company, Limited and Exxon Neftegas Limited companies within the framework of the joint program for the monitoring of gray whales and other marine mammals. The study presented in this report was conducted under the contract No. 25-03 between VNIRO (All-Russian Research Institute of Fishery and Oceanography) and TINRO-Center in Vladivostok.

FIELD METHODS

In 2003, as in 2001 and 2002, aerial surveys off northeast Sakhalin Island were conducted in a twin-engine Russian-designed fixed-wing aircraft An-28 provided by Vostok Air, Khabarovsk. The design of this aircraft allowed approximately four hours of flight before refueling, and the total daily flight time of the crew was limited by regulation to not exceed seven hours.

Four aerial survey grids were proposed in order to provide the most complete coverage of both local and regional distribution of marine mammals in coastal waters along northeast Sakhalin Island in the areas of concentrations of gray whales and/or in the vicinity of current/planned activities by ENL and SEIC.

Survey Area

Intensive (Piltun Feeding Area) Survey Grid

The Intensive (Piltun) aerial survey grid covered specific coastal areas, including waters <20 m deep, adjacent to Piltun Lagoon and to the ENL Odoptu license area. This nearshore area comprises a major summering habitat of Western gray whales (Berzin *et al*. 1988, 1990, 1991; Sobolevsky 2000, 2001; Weller *et al*. 2000, 2001ab). The four transect lines in this coastal grid were spaced 2 km apart parallel to the shoreline, and extended eight km seaward covering an 88-km long stretch of coast (100% coverage) from 52° 42.5' N to 53° 30.5' N. The 20-m isobath runs along the shore ~3 km offshore, i.e., roughly along transect line 2, for the majority of the area except the southernmost ~20 km (Figure 2). Each transect was subdivided into five segments, or "blocks", with block 5 in the far north and block 1 in the far south (Table 1).

The Intensive (Piltun) aerial survey grid covered the entire ~720 km^2 (8 km x 90 km) coastal area adjacent to Piltun Bay (Figure 2). This sampling grid included all areas where gray whales were previously known to feed in the Piltun Bay area. All surveys were flown 300 m above sea level (ASL), except line 2 on 19 September (Survey 29, Table 6), which was flown 200 m ASL due to low overcast.

Besides complete surveys which included all four transects, additional partial surveys were conducted on only lines 1 and/or 2, since this area had to be traversed from the flight base in Okha to survey areas other than the Piltun feeding area. We recognize a separate survey when the area is surveyed one time during one day. For instance, if line 1 was surveyed in the morning on the way to the Offshore area or Lunskoye area and then line 2 was surveyed on the way back, these two events are considered one survey, even though they may be separated by a few hours. If a line was surveyed twice during the same day, two separate surveys are recognized.

Complete surveys were conducted on six occasions (5 June, 7 June, 5 July, 20 August, 18 September, and 26 October). Partial surveys including one line (line 1 or 2) were conducted five times, partial surveys including two lines (lines 1 and 2) were conducted 17 times; partial survey including three lines (lines 1, 2, 3) was conducted once. In total, 30 full and partial surveys of the Piltun area were conducted in the sense outlined above (Table 6). Relative prevalence of surveys including two lines is due to the fact that the Piltun area was passed on the way to other survey areas.

If a stricter definition of a survey is adopted, i.e., if only an unbroken overflight over an area is considered a survey of that area, then 49 surveys (44 partial and 5 full surveys) of the Piltun grid were conducted.

Offshore Feeding Area Survey Grid

This grid covered the major feeding area discovered and studied in 2001 (Maminov and Yakovlev 2002, Yazvenko *et al*. 2002) (Figure 1, Table 2). The grid stretches from 51° 52.850'N to 52° 25.196''N and from 143° 23'E to 143° 44'E. Each of nine transect lines was ~100 km long and were spaced 3 km apart. Surveys were conducted at 500 m ASL; therefore, at this altitude, objects seen at 30% declination angle were 1650 m away from the centerline of the moving aircraft, thus providing intensive (100%) cover of the survey area, except for the blind strip underneath the aircraft (Figure 7).

Due to restricted time and sometimes poor weather, not a single survey covered all nine survey lines. There were four near-complete surveys conducted that covered seven to eight lines and eight partial surveys that covered one to four lines, to the total of 12 surveys.

Extensive (Broad-Scale) Survey Grid

The Extensive (Broad-Scale) aerial survey grid sampled a broad area of nearshore and offshore waters along the entire northeast coast of Sakhalin Island. This survey grid consisted of 34 transects, each 50-km long and aligned E-W, roughly perpendicular to the coast (Figure 1, Figure 5, Table 4). This sampling grid was originally designed in 1999 with 50 km long transects (Sobolevsky 2000) and modified in 2000 (transects were shortened to 20 km long,

Sobolevsky 2001) in order to sample large-scale nearshore and offshore areas away from the known gray whale aggregation area near Piltun Bay and to document other groups or aggregations of gray whales that may be present in this broader area. Surveys of the Extensive grid in 2003 covered the approximately 330 km long stretch of coast extending from ~51° 00' N to ~54° 00' N.

By adopting an effective strip width of 3.3 km (1.65 km on either side of the aircraft) for conspicuous animals, the 34 transects of the Extensive grid sampled ~5450 km^2 or ~33% of the total Extensive grid area of ~16,500 km^2. Transect lines were spaced 10 km apart, were oriented E-W, and were flown in an E-W and W-E direction at an altitude of 500 m ASL. The surveys of the Extensive grid also included 10-km segments between transects. These segments were oriented along the coast (primarily N-S) in the shoreline leg between transects and N-S in the offshore leg between transects.

Two sets of surveys were conducted. The first set (8-9 July) covered lines 11-34. The second set (20-21 September) covered lines 1-34 (Table 6).

Lunskoye Area Survey Grid

Twelve transect lines were established to cover the entire Lunskoye License area and the surrounding area (Table 3, Figure 1, Figure 4). Each of 12 transect lines was ~100 km long and were spaced 3 km apart. Surveys in this area were conducted at 500 m ASL; therefore, at this altitude, objects seen at 30% declination angle were 1650 m away from the centerline of the moving aircraft, thus providing intensive (100%) cover of the survey area, except for the blind strip underneath the aircraft (Figure 7), if all transect lines were flown. Time and budget constraints dictated that every second line (odd numbers) were flown; therefore, at a minimum of 30% declination angle, 50% of the area was surveyed, except for the blind strips (450 m from the centerline of the transect on each side of the aircraft).

Six sets of surveys were flown in 2003 (Table 6).

Survey Design

Survey procedures generally followed those recommended by the High Energy Seismic Survey (HESS) team guidelines for southern California waters (HESS 1999). The HESS guidelines recommend that "All aerial surveys should be flown in a two-engine, fixed-wing aircraft. At a minimum, the survey crew should consist of two observers, one data recorder/observer, and a pilot. Surveys should be flown at an altitude of 1000 [feet] ASL and a speed of 100 kts (180 km/hr). Standard equipment should include a GPS navigational system tied to an onboard computer and an intercom system connecting all crew members…" (See Section 4.2.5 of HESS 1999 for additional details).

Two observers and two pilots were present in the An-28 at all times. The design of the aircraft precluded the possibility of placing a third person, i.e., an aerial survey observer, in the cockpit. Therefore, each of the two observers sat on the side of the aircraft and surveyed a strip on each side of the aircraft that corresponded to declination angles 30-110% and extended from 270 m to 1000 m outward from the centerline of the transect at an altitude of 300 m ASL (Piltun grid) or from 450 m to 1650 m from the centerline at an altitude of 500 m ASL (Extensive, Offshore, and Lunskoye grids) (Figure 7). As in 2001 and 2002, the Piltun grid was surveyed at 300 m ASL and all other grids (Offshore, Lunskoye, and Extensive) were surveyed at 500 m ASL.

The aircraft was equipped with survival equipment and supplies, a radar altimeter and Global Positioning System (GPS) equipment, which allowed replicate sampling of the same sets of transects during each survey. The aircraft was also equipped with headphones for all marine mammal observers to enable immediate real-time communication, including communication with the aircraft crew. In addition to the aircraft GPS system, marine mammal observers had a dedicated Garmin© 12XL GPS unit. This GPS unit automatically logged track-line positions and precise times every 30 seconds, and was able to store up to 500 waypoints. The trackline positions and times were used to reconstruct the route and the time of each survey.

Aerial Survey Personnel

Aerial surveys were conducted by the same personnel as the surveys in 2002. Each of the two marine mammal observers had many years of experience in conducting aerial surveys and identifying and recording information about marine mammal species likely to be present in the area. The surveys were performed with the participation of Sergei A. Blokhin (observer on the left side of the aircraft), Nikolai V. Doroshenko (observer on the right side of the aircraft) from TINRO-Center, and Ivan P. Marchenko (GPS and computer operator); Sergei Blokhin also recorded meteorological conditions with a tape recorder and computer.

Safety Procedures

All aerial survey crew members passed a Russian training program roughly equivalent to the North American Basic Ocean Safety and Survival (BOSS) training course. The An-28 fixed-wing aircraft was equipped with all necessary survival equipment and clothing.

Survey Procedures

During the years of gray whale behavior observations in the Piltun area (Würsig *et al.* 1999, 2000, 2002, 2003; Gailey *et al*. 2004), gray whales were found to spend about 1.4 min on the surface ("surface time") and 2.1 min during a dive ("dive time") during an average 3.5 min surface-dive cycle ("surface time" plus "dive time" in Gailey *et al* 2004, Table 8). Thus, on average, gray whales in the Piltun feeding area are present at the surface and potentially visible for detection approximately 42% of the time. Consequently, a large fraction of gray whales (perhaps a majority) are not detected from a fast moving aircraft covering 3.3 km/min at a survey speed of ~200 km/hr. Although similar behavioral data are not yet available for areas other than the Piltun feeding area, it is expected that only a portion of the whales are sighted at the surface on all grids (Extensive, Offshore, and Lunskoye), although higher altitude on other survey grids may affect the potential sighting duration. Systematic aerial surveys of strip transects designed to provide 100% coverage of a study area give the best snap-shot or index of gray whale abundance in an area[1]; however, sightings and whales mentioned in this report should not be

[1] The actual coverage of the survey area depends on the design of the survey aircraft. The An-28 used in these surveys leaves a blind strip from approximately 110% declination angle towards the centerline, i.e., 270 m on each side of the centerline at aircraft altitude of 300 m ASL. However, this shortcoming does not represent a problem for the method as long as the blind strip is consistent among surveys.

viewed as the actual numbers of whales present, but as quantitative indices of distribution, abundance and feeding activity.

The aircraft flew along pre-selected transects (see Survey Design section above). Every effort was made to maintain a steady ground speed in the aircraft. The actual ground speed for the aircraft averaged around 200 km/hr but ranged from 180-220 km/hr from line to line, depending on wind direction and velocity. All observers had digital watches that displayed hh:mm:ss, and all watches were synchronized with the GPS unit at the start of each survey. Portable tape recorders were used to record all data during the surveys. As noted above, each transect in the Piltun and Lunskoye grids was broken into five smaller segments (blocks) with fixed boundary points (waypoints) that remained consistent throughout the season. Each transect in the Offshore grid was broken onto six smaller blocks with fixed boundary points. The survey of each segment in the Piltun, Lunskoye, and Offshore areas required approximately 5-6 minutes. Transects of the Extensive grid were not broken down to smaller segments. Weather (cloud cover in percents, estimated wind direction and speed, temperature, precipitation), fog, sea state (wave height in feet, swell height in feet, Russian white cap index, Russian sea state index), glare, and visibility were recorded at these boundary waypoints if weather did not change, or at the point of change if the weather did change (Appendix 2). Transect start and end time information was also recorded both on the tape recorder and as GPS waypoints (Table 5).

Marine mammal observers continually scanned the sea, focusing on the 270-m to 1000-m wide section of the transect strip on each side of the aircraft, but also recording all important sightings observed inside and outside that strip. Suunto PM 5/360 PC clinometers were used to determine the angle and thus the outer edge of the 1000 m wide (on each side of the aircraft) transect strip. No attempt was made to adjust the strip boundaries or adjust whale densities (number of whales per km^2) to account for "earth curvature" as described by Lerczak and Hobbs (1998). Consequently, the transect width used in the surveys is probably slightly underestimated (Richardson and Williams 2000). When marine mammals were sighted, a "marine mammal sighting" was logged as a GPS waypoint and also recorded on tape. For gray whales, a sighting consisted of an observation of one or more gray whales; specific attention was paid to whether the gray whale was or was not associated with a mud benthic feeding plume(s), or whether mud benthic feeding plumes were associated with a nearby gray whale. For gray whales, the

orientation (compass direction) and activity (i.e., feeding on benthic organisms) of the whales was also recorded on tape. The GPS coordinates of the aircraft were recorded when a gray whale was logged. Clinometers were used to measure the vertical declination angle (measured in percents for ease of conversion into distances) to each gray whale, or group of gray whales, or mud benthic feeding plume(s). Aircraft position, clinometer angle, aircraft altitude, and GPS waypoint number were recorded at the point of closest approach, i.e., when the whale was directly perpendicular to the aircraft.

Observations of mud benthic feeding plumes were recorded both near observed whales and when whales were not observed; GPS positions and clinometer angles were recorded for each mud feeding plume in exactly the same manner as they were for whale sightings. Considering that the aircraft covered over 3 km/min while cruising, and that gray whales in shallow coastal waters spend about 60% of time underwater (i.e., diving for 2-6 min), it is reasonable to assume that observers did not detect some gray whales that were present in the area. In contrast, a benthic feeding plume probably remained visible for several minutes and was often sighted with no whale seen on the surface near it.

All sightings of other cetaceans were recorded with the same degree of detail. Although gray whales and other cetaceans were the highest priority during the surveys, known aggregation areas of pinnipeds, i.e., near the entrances of Piltun, Chayvo and Nyjskiy bays, were also surveyed; the locations and approximate numbers of pinnipeds were recorded whenever possible. Detailed weather and visibility data were recorded during all overflights (see Table 5) either at the entry of every segment on the Piltun and Offshore grids (about every 5 minutes) or every time that the condition changed, whichever came first. Weather data are provided in Appendix 2.

The support base for the survey aircraft and crew was the town of Okha, at the northern end of the study area, so it was not always possible to predict the weather/sightability conditions in the entire survey area before a survey started. For instance, the distance from Okha to the northern end of the Offshore feeding area grid was ~140 km; the distance to the northern end of the Lunskoye area grid was ~210 km, and to the southern end of the Lunskoye area grid and to the Extensive grid was ~300 km. Also, weather forecasts were sometimes lacking sufficient

detail to plan the survey appropriately. These shortcomings resulted in some surveys or parts of surveys flown under less than ideal conditions (see Appendix 2).

Aerial surveys were conducted monthly, provided that the total flight time was no more than 30 h. Between June and early December 2003, six sets (rounds) of aerial surveys were performed in the following time periods:

1. 5-7 June;
2. 5-15 July;
3. 18-20 August;
4. 18-22 September;
5. 21-28 October; and
6. 29 November and 2 December.

The detailed description of surveys is in Table 6; sampling grids for these aerial surveys are given in Tables 1-4 and Figures 1-5.

Unfavorable weather conditions created in the Far East region because of frequent cyclones in the summer and fall of 2003 forced the aerial survey team to make some adjustments in the program. Out of the 64 days that the aerial survey team with the aircraft was on Sakhalin Island (*vs.* 49 total days in 2002), actual surveys were performed during 22 days, or 34.4% (in 2002 there were 20 flying days, or 40.8%). The runway in the Nogliki airport was under reconstruction all season and thus unusable; therefore, the aircraft was based in the town of Okha (53° 35’ N), near the northern end of the Intensive (Piltun) survey area. The remoteness of this locality from the Offshore and Lunskoye survey areas increased the total flight time. Therefore, it was decided to reduce the number of transect lines in the Lunskoye and Piltun grids by half; in the Piltun grid, the aircraft often surveyed only the first two (most coastal) transects. A total of 126.5 h of flight time were completed during the period under study, of which 83.5 h of net survey time and 43.0 h of ferry time between survey grids and from/to the base in Khabarovsk were logged (Table 6, Table 7).

During the aerial surveys, the pilot sought to maintain the flight speed at 180 km/h. However, the minimum safe cruising speed for the An-28 was frequently no less than 200 km/h

when there was a tail wind and even 220–230 km/h with a strong tail wind. In good weather, an observer detecting a whale (whales) in a 10–11 or 1–2 o'clock direction could see it (them) for 15–20 s.

Although the activity (i.e. feeding) of whales is difficult to determine from an aircraft, it can be characterized by some well-detectable traits. The position/orientation of an animal body at the moment of observation circumstantially indicates the direction of its movement. This direction was designated as southward for the whales headed to the south, southwest, or southeast, and northward for the opposite orientations.

Gray whales feed primarily on benthic organisms, and gray whale sightings are frequently accompanied by mud plumes differing in color and size and are a characteristic feature unique to gray whales. However, it is important to note that some eastern gray whales have been documented to feed periodically on epibenthic and planktonic crustaceans, such as mysids, cumaceans, and crab larvae (Nerini 1984; Dunham and Duffus 2001, 2002) and some recently reported behavioral observations along the northeast coast of Sakhalin Island during 2002 suggest that western gray whales may be utilizing non-benthic food resources during part of the summer (Würsig *et al.* 2003). Therefore, mud plumes only facilitate the detection from an aircraft of gray whales feeding on benthic food resources. The presence of mud plumes near a whale provides evidence that the animal is feeding on benthic organisms at the moment of observation and whales feeding on other (non-benthic) resources may not have an associated plume.

Good meteorological conditions were considered necessary for aerial survey. White caps on the sea surface were the most significant factor limiting detectability of whales, as was shown in preceding years (Yazvenko *et al*. 2002). However, the weather could sometimes deteriorate during a flight or vary within a survey area. Therefore, surveys sometimes continued in the presence of small white caps. This was more frequent for aerial surveys of the Extensive grid. Severe white caps caused surveyors to abort the survey. Fog was only present on transect lines ones and two during surveys conducted in the Offshore grid on 27 July 2002 (see Appendix 2).

Under good weather conditions, gray whales could be recorded at different distances from the aircraft even beyond the survey strip. However, only the data from observations within

the clinometer indication range 30–110% were used for numerical analyses. This corresponded to the survey strip of 730 m (270 m to 1 km from the aircraft) for flights at 300 m ASL, and about 1200 m (< 1.65 km from the aircraft) at 500 m ASL (Figure 7). At the same time, the data on sightings of animals in the 10–120% survey strip were used to describe distribution of whales in the Piltun and Offshore feeding areas and in maps of raw sightings. As the main focus was on gray whales, data on sightings of other cetaceans are presented without much discussion. Raw data on gray whale sightings are given in Appendix 1, and detailed information on the weather conditions during surveys is provided in Appendix 2.

Six sets, or rounds, of aerial surveys were conducted from June through December 2003; survey sets were spaced roughly once a month (Table 6). Aerial surveys of the Extensive grid were conducted twice during 2003, on 8-9 July and 20-22 September.

The adverse weather conditions prevailing in the summer and fall of 2003 due to frequent cyclones in the region forced certain changes to be made in the work, prolonging the time spent on performing the whole program of aerial surveys. Thus, of the 64 days that the scientific group spent on Sakhalin, flights were conducted on 22 days (34.4%), and the total flight time was 126 hours (Table 6).

There was a portable satellite navigator onboard the aircraft (GPS Garmin© III+), into which the coordinates of the transects in all of the study areas were entered, enabling the crew to orient the aircraft independently and to follow the suggested transect patterns.

The research group that took part in the flights consisted of three people: two observers (one on each side) and one GPS/PC operator, who worked with a personal GPS Garmin© 12XL, recording the coordinates of the transects' turning points and the locations where whales were sighted. Communication between them and the aircraft crew was conducted with a built-in intercom. The observers' place was in the front part of the aircraft cabin, at the second windows, which gave them an unobstructed view of the sea in the range of declination angles from 10 to 110% of clinometer reading (Figure 7). Each observer had a tape-recorder for recording

information about the whales that were sighted and weather conditions during the flight (Table 5).

During the flight, when an observer sighted a whale, he reported this over the intercom (as soon as the animal was sighted on the aircraft transect) to the record keeper. The record keeper registered this point on the GPS, entered its number on an index card and then told it to the observer over the intercom. After each day of surveys, all of the recorded information was taken from tape recorders and entered onto special index cards and into an MS Excel© spreadsheet. The GPS data (waypoints and tracklines) were downloaded from the GPS unit to a laptop using the program Waypoint+; copies were made for safety and sent to the Contractor and the Client by e-mail as soon as Internet access was available but no later than upon return to Vladivostok after a round of surveys.

It was hard to determine the behavior of the whales that were sighted from the aircraft; therefore, only some obvious characteristics of it were logged, mainly body directional orientation interpreted as an indication of the direction of its movement at the moment of sighting. Body orientation of whales to the southwest or southeast at the time when they were sighted was identified as southerly. The opposite direction was identified accordingly as northerly.

DATA ANALYSIS

Univariate analyses

Histograms were developed in MS Excel© and wisker-box diagrams – in Statistica© (Borovikov 2001) to analyse various univariate parameters of the data.

Data types

Type 1

Includes all sightings of gray whales (on- and off-transect) made on both full and partial surveys. Also includes the results of Extensive surveys over the corresponding area (Piltun or Offshore). Used in distribution maps and diagrams analyzing distribution.

Type 2

Includes on-transect sightings of gray whales made on both full and partial surveys; does not include June and November-December because of low numbers of observed whales. Does include the results of Extensive surveys. Used in maps of abundance and survey effort and diagrams analyzing abundances.

Type 3 (Piltun area only)

Includes on-transect sightings of gray whales made on both full and partial surveys only on transect lines 1 and 2 (Piltun area); does not include June (0 GWs seen) and November-December (1 GW seen). Does not include the results of Extensive surveys. Used in diagrams of abundances.

Mapping gray whale distribution

In the Piltun and Offshore feeding areas, maps illustrating the distribution of gray whales were prepared for each set of surveys, which in most cases except November-December coincided with months. For these distribution maps, all sightings of gray whales within the Piltun and Offshore grids were pooled together from both full and partial surveys conducted during the set of surveys. Both sightings of gray whales on transect and off transects were used. The data obtained on the Extensive grid surveys were added to the data set used to construct July and September maps.

Summary map of gray whale distribution over the entire season included all sightings of gray whales made on all survey grids. ESRI ArcView© was primarily used for mapping.

Mapping survey effort and gray whale densities

Survey effort, particularly in the Piltun feeding area, was uneven: lines 1 and 2 were surveyed more frequently than lines 3 and 4 (Table 6). Therefore, it was necessary to adjust the resulting sightings of gray whales for survey effort, i.e., the number of kilometers of survey conducted per unit area per month. A grid was constructed of cells oriented perpendicular to the coast and following the trend of the shoreline. Each grid cell was 2 km along the shoreline and 3 km perpendicular to the shoreline. Survey effort was then computed for each grid cell using the

automatic GPS trackline data collected by the aerial survey team in the process of aerial surveys. This produced a series of maps illustrating the pattern of survey effort per set of surveys, i.e., per month (Figure 23 - Figure 28).

The number of gray whales observed (excluding whales observed off-transect, i.e., at inclinometer declination angles <30%) per grid cell per month was then divided by the weighted average survey effort to compute the density of gray whales (number of whales seen per cell per 1 km of survey line).

Thematic maps were then prepared illustrating the monthly whale distributions by coloring the cells in proportion to the computed relative whale density (Figure 29 - Figure 33 for Piltun area and Figure 59 - Figure 65 for the Offshore area).

The total average monthly numbers of gray whales in the Piltun and the Offshore areas were derived from the densities by summing all densities over the entire grid areas, Piltun or Offshore areas (Figure 34).

Mapping gray whale feeding

Maps showing the locations of observed gray whale feeding plumes were overlaid with the coordinates of the feeding points of gray whales (locations where gray whales were seen feeding in 2003) collected by the expedition on the vessel *Nevelskoy* in August-September 2003 (Fadeev 2004) (Figure 69).

RESULTS

During the study period, a total of 50 aerial surveys in all areas (Piltun, Extensive, Offshore, and Lunskoye sampling grids) were conducted, including partial surveys that covered at least one full transect (Table 6). Of these, 30 surveys of the Piltun feeding area, 12 surveys of the Offshore area, 6 surveys of the Lunskoye area and 2 surveys of the Extensive grid were conducted. A total of 395 sightings of 532 individual cetaceans were recorded by all aerial observers in all survey areas. Of this total, there were 232 sightings of 327 individual gray whales (on- and off-transect sightings, excluding mud/feeding plumes without associated gray whales). It is important to note that this includes multiple sightings of the same animals and does

not have any implications on population size. Besides gray whales, 23 sightings of 40 other cetaceans were made, including minke whales (13 sightings of 18 animals), Baird's beaked whales (1/2), killer whales (6/17), and unknown large whales (3/3) Figure 74, Table 10).

In all 2003 surveys, gray whales were observed only in their two known summer habitats, the Piltun and Offshore feeding areas (Figure 9).

Intensive (Piltun Feeding Area) Survey Grid

In the Piltun feeding area, 288 sightings of 396 gray whales were made (excluding benthic mud/feeding plumes with no associated gray whales). Of these, 205 sightings of 274 gray whales (excluding benthic mud/feeding plumes with no associated gray whales) were made on-transect, i.e., within the 1 km survey strip during regular Intensive surveys. Also, 21 sighting of 25 gray whales were made in the Piltun feeding area during two Extensive grid surveys. These sightings are not included in analyses of abundance but included in summary distribution maps and maps of survey effort and densities.

Data obtained during full surveys (61 gray whales seen on-transect) comprises just 22% of the entire on-transect data set, and the distribution of whales based on the entire data set is not significantly biased towards lines 1 and 2 (comp. Figures 11-15 with Figures 29-33). Therefore, it was decided to use the entire data set for nearly all numerical analyses in the report. The issue of under-representation of lines 3 and 4 is further dealt with in paragraph "Survey effort and adjusted observed densities of gray whales" below.

As in 2001 (Yazvenko *et al*. 2002) and 2002 (Blokhin *et al*. 2003), gray whales were most often (74% of sightings) recorded at declination angles of 30-100%, i.e., at offsets of 300-1000 m (Figure 8). Outside the limits of 1000-m viewing strip were 26% whale sightings (Figure 7, Figure 8).

Sighting locations and complete data from the aerial survey of gray whales in the Piltun area are given in:

- Figure 10 (summary map);
- Figure 11 to Figure 15 (monthly distribution maps);

- Figure 16 (comparison of 2003 data with earlier aerial survey data);
- Figure 18 (monthly means of gray whale numbers in 2003); and
- Appendix 1 (the list of all sightings with auxiliary information).

Gray whale abundance and distribution

Gray whales were encountered in the Piltun Area during five of the six survey periods, except for the June overflights when no gray whales were seen (Table 8). Ice of various densities was still present in the immediate vicinity of the shore in early June, which might have accounted for the lack of sightings of whales.

The number of gray whales counted in the vicinity of Piltun Bay was not fixed, it varied in different months but a trend was present toward an increase in the number of gray whales until 20 August, when the maximum number of them was counted here: 27 whales on-transect and 39 on- and off-transect. After that, the number of whales recorded in the area tended to decline (Table 8, Figure 17, Figure 18). At the end of November the coastal waters near Piltun Bay were covered with young ice (frazil), and no whales were detected on 29 November. However, on 2 December frazil had been dispersed by an easterly swell, and it was present only in the nearshore zone (up to 1 km offshore). One whale was sighted 3 km from shore on 2 December.

The numbers of gray whales observed on individual surveys on-transect on lines 1 and 2 and averaged over a survey set (month) showed no statistically significant differences between months except for June (zero whales seen) and November-December (1 whale seen) (Figure 18). Tukey honest significant difference (HSD) for unequal N, or Spjotvoll/Stoline test, was used to compare several means at once (Spjotvoll & Stoline 1973).

Gray whales were unevenly distributed in the Piltun area, but 94.7% were observed <4 km from shore (mean distance offshore of sightings of gray whales 1987m ± 70.5m), i.e., they were sighted during flights on transect lines 1 and 2. Differences in the numbers of whales counted on lines 1 and 2 were statistically insignificant (Figure 20). For ~80% of the Piltun feeding area, 20-m isobath runs ~3 km offshore (Figure 2); 84.8% of gray whales (full and partial surveys combined) were observed within 3 km offshore (Figure 21). With partial surveys

which do not cover lines 3 and 4 excluded, 92.3% (on- and off-transect sightings) or 91.8% (on-transect sightings only) of gray whales were seen on lines 1 and 2.

During the season, the mean distances of gray whales from shore changed in a complex pattern along the length of the feeding area. As an example, the dynamics in sector 4 (north), for which a considerable data set (85 sightings) exists, is presented in Figure 22. Mean distance offshore of gray whale sightings was significantly (Spjotvoll/Stoline test) larger in August (2810±1441 m) than in September (1699±847 m) and October (1258±828 m).

Short-term changes in distribution of whales were observed; e.g., on 5-10 July, 29,8% of whales were recorded in sector 4 and 10.6% - in sector 1, whereas on 15 July, 29.4% were seen in sector 1 and only 11.8% - in sector 4 (Figure 36). Monthly distribution maps (Figure 11 - Figure 15) show that in July gray whales were relatively evenly distributed over the whole area, while in August more than half of the whales were sighted in the southern part of the area (sectors 1 and 2). In September and October, gray whales were seen more frequently in the northern half of the area (Figure 37, Figure 38, Figure 6). Throughout the season, there were typically fewer gray whales in sector 3, and they were observed primarily opposite and to the north of the Piltun lighthouse, and in the area where the SMNG onshore drilling rig is located, opposite the northern part of Piltun Bay (Figure 38).

Survey effort and adjusted observed densities of gray whales

Survey effort was skewed towards lines 1 and 2 in all survey sets (Figure 23 - Figure 28). In July this bias seems most pronounced; in November-December, lines 3 and 4 were not surveyed at all. Therefore, the data needed to be adjusted for the differences in survey effort. The distribution of computed relative densities of gray whales (Figure 30 - Figure 33) is quite similar to the distribution of raw sightings (Figure 11 - Figure 15).

The total computed average monthly numbers of gray whales in the Piltun area derived by summing all densities over the entire Piltun grid area (Figure 34) show that in June there were no observed gray whales in the Piltun area; the numbers in July, August and October were similar around 15 whales; the peak of 33 gray whales occurred in September; by November, gray whales were not seen in the Piltun area.

Mother/calf pairs

On two occasions, mother/calf pairs were observed in the Piltun area. On 15 July, a mother/calf pair was seen ~200 m from shore at 53.16225ºN and 143.26329ºE. No feeding plumes were observed. On 20 August, a mother/calf pair was seen 600 m from shore at 53.23628ºN and 143.26318ºE. No feeding plumes were observed.

Group size and orientation/movement

Single whales were observed most often (73.6%). Groups of two individuals were found in 18.7% cases; and groups of three, in 5.6% cases (Figure 39). The mean group size was 1.37±0.71.

Most of the whales sighted in the Piltun area were oriented either north or south in the sense outlines above (Figure 40). The predominant orientation varied throughout the study period and in different sectors of the area. During the third set of surveys (August), the observed whales were more often oriented to the south, while in September and October they were more frequently oriented north, and this difference was statistically significant (Figure 41). The difference in the whales' orientations in various sectors of the Piltun area also was significant. In sectors 2 and 3, the whales were more often seen oriented in a southerly direction, while in the northern sectors (4 and 5), most of them were moving to the north (Figure 42). Diurnal changes in orientation in the evening (1600 h on) of whales more often swimming north than in the morning (0800 h – 1200 h)) were found to be insignificant (Figure 43).

Gray whale feeding

Feeding index in 2002 was variable in time and in different areas of the Piltun feeding area. The fluctuations of feeding index through the season were statistically insignificant (Figure 44). The feeding index varied in different sectors, i.e., gray whales recorded in sectors 2 and 3 showed higher feeding activity than those in sector 4 ($P<0.002$; Figure 45).

Other marine mammals

Four Minke whales (*Balaenoptera acutorostrata*), four killer whales (*Orcinus orca*), one fin whale (*Balaenoptera physalus*) and one large unidentified whale were seen in the Piltun area (Figure 74, Table 10).

Offshore Feeding Area Survey Grid

In the Offshore feeding area, 38 sightings of 67 gray whales were made (excluding benthic mud/feeding plumes with no associated gray whales). Of these, 24 sightings of 41 gray whales (excluding benthic mud/feeding plumes with no associated gray whales) were made within the 1650-m survey strip. This data include one gray whale sighted in the area during the Extensive grid overflight on 9 July.

Gray whale abundance and distribution

Gray whales were present in the Offshore area throughout the entire duration of the studies, from early June through the end of November (Table 9, Figure 46, Appendix 1). As in the Piltun area, the number of whales recorded here was not constant throughout the study period. The highest number of gray whales (17, excluding unassociated mud plumes) was observed on 8 July; the least, in June (3) and November-December (3 and 0); in October, there were no whales seen. However, if off-transect sightings are eliminated, the picture is slightly different (Figure 53). Whales were more often found on transects 5 and 6 (47 whales, or 64% of all observed whales) in the southern half of the area (Figure 54). Gray whales were noted in groups of varying size, but single individuals were observed most often (67.5%, Figure 55). About half (48.9%) of all the whales recorded were swimming in a southerly direction at the time when they were sighted, and 24.4% were swimming north (Figure 56).

The total average monthly numbers of gray whales in the Offshore area derived by summing all densities over the entire grid areas, Piltun or Offshore areas (Figure 34) show that in June there were no gray whales in the Piltun area; the numbers in July, August and October were similar around 15 whales; the peak of 33 gray whales occurred in September; by November, gray whales were not seen in Piltun area. It is important to remember that all these numbers are

derived from the observed numbers and reflect the index of abundance rather than a true abundance.

Survey effort and adjusted observed densities of gray whales

Survey effort was skewed so that lines 1-3 were under-sampled (Table 6). This necessitated the adjustment of the data for the uneven survey effort. The distribution of computed relative densities of gray whales (Figure 59 - Figure 65) adjusted for the survey effort is quite similar to the distribution of raw sightings (Figure 47 - Figure 52).

The total computed average monthly numbers of gray whales in the Offshore area derived by summing all densities over the entire Offshore grid area (Figure 34) show that in June, October and November-December there were few gray whales observed in the area; the numbers in July, August and September were similar at 7-9 gray whales.

No direct evidence of movements of gray whales between the two major feeding areas, i.e., no sightings in the area between the two, was collected in 2003.

Gray whale feeding

As in 2001 and 2002 (Yazvenko *et al*. 2002, Blokhin *et al*. 2003), gray whales were found feeding in the Offshore area in all months except the very end of the season (late November). The highest index of feeding gray whales (77%) in this area was noted in July; and the difference between that and the index of feeding in October (40%) was found marginally significant (Figure 57). On 29 November, only three gray whales were found, and there were no mud plumes beside them.

The locations of feeding plumes overlaid on the locations of feeding points collected by the benthic research team in the Offshore area show remarkable similarities where they overlap (Figure 69). Feeding points extend further to the east outside the grid area; there are no aerial observations in that area.

Other marine mammals

Other than gray whales, five Minke whales and one large unidentified whale were seen in the Offshore area (Figure 74, Table 10).

Extensive (Broad-Scale) Survey Grid

During the surveys of the Extensive grid, gray whales (22 sightings and 26 individuals) were noted only while surveying the Piltun (21/25) and Offshore (1/1) areas.

Two Minke whales and two Baird's beaked whales (*Berardius bairdi*) were found on the Extensive grid (Figure 74, Table 10).

Lunskoye Area Survey Grid

Gray whales were not seen in the Lunskoye region. Seven sightings of seven solitary Minke whales and six sightings of 17 killer whales (a single whale, four groups of three and one group of four individuals) were made (Table 10).

DISCUSSION

Earlier observations revealed that during a season gray whales appear in the Piltun area after the sea is clear of ice (Blokhin 1996, Blokhin *et al*., 1999). In some years, gray whales were seen here in the second half of May (Blokhin *et al*., 1999). However, during the first set of the aerial surveys in early June 2003, the whales were not found in the Piltun area, although three whales were seen in the Offshore area. At that time, ice of varying density was still present near Piltun, which could have deterred gray whales from moving into the area.

During the aerial survey in 2003, the sightability of whales varied with the distance from the aircraft: most animals were recorded at angles 30-100%, which in the Piltun area translates into offset distances of ~300-1000 m (Figure 8). Sightability patterns were thoroughly studied in 2001 on a large aerial survey data set (Yazvenko *et al*. 2002).

Piltun Feeding Area

Gray whale distribution and abundance

The 2003 aerial surveys confirmed earlier results (Perlov *et al*. 2001; Blokhin *et al*. 2002; Weller at el. 2002, Yazvenko *et al*. 2002) which established that the observed number of gray whales in the Piltun area fluctuates throughout the season. In 2003, as in 2001 and 2002, the greatest number of whales was observed in August, and an appreciable reduction in the number of gray whales occurred in October-November (Figure 17, Figure 18). Since the sea off the northeast coast of Sakhalin is still free of ice at that time, the presence of ice is not the main reason for the late-fall decline in the number of gray whales in the vicinity of Piltun Bay. Among possible reasons why the whales visit the Piltun area less frequently late in the season may be the depletion of prey (Blokhin *et al*. 2002).

The average number of gray whales counted in the Piltun area in August-October 2002 was not significantly different from the number of whales during the same period in 2003 (15 and 12.1, respectively) (Figure 58).

The group size (1.37±0.70) is quite similar to that obtained by the shore-based scientists studying behavior of gray whales in Piltun (1.30±0.56; Gailey *et al*. 2004). This is unexpected, because a common opinion (Weller *et al*. 2002) holds that the data obtained during aerial surveys under-estimate the actual composition of groups of gray whales in their feeding grounds, because some of whales during the 12-14 seconds of a sighting may be underwater.

Earlier studies (Blokhin *et al*. 1999; Weller *et al*. 1999; Sobolevsky 2000; Blokhin and Burdin 2001; Blokhin *et al*. 2002, Yazvenko *et al*. 2002) established that the distribution of whales in the Piltun area changes in season. This was confirmed by the aerial surveys in 2003, which showed that the distribution can change even in a short period of time (e.g., Figure 36). Seasonal patterns of north-south redistribution of gray whales along the coast were similar to those observed earlier. In July, the whales were more or less evenly distributed over the entire area, while in August 65.7% of the whales were encountered in the southern part (Sectors 1 and 2). In September, the animals were encountered more often in the northern half of the area

(55.4% in Sectors 4 and 5), and this trend not only persisted but intensified greatly in October (80% in Sectors 4 and 5) (Figure 37, Figure 38).

Similar trends in distribution were noted in 2001 (Yazvenko *et al*. 2002) and in 2002 (Blokhin *et al*. 2003). In 2002, 87% of the whales sighted in late July and early August were in the south, in sectors 1 and 2, while, in September, 70.2% were seen in Sectors 3 and 4; in October 57.7% were seen back in sectors 1 and 2 and by November most whales were observed in sector 4 (67.7%). In 2001, the observed distribution of gray whales was even more dynamic and changing over short periods of time, perhaps due to dense sampling in time (almost daily surveys); overall, in August most whales kept in sectors 1 and 2, while in late September the concentration shifted to the north and in November, gray whales were more prevalent in the northern sectors (3 and 4) of the Piltun area in comparison to other months (Blokhin *et al*. 2002, Yazvenko *et al*. 2002).

Thus, the data obtained in 2003 confirmed a previous observation that the distribution of gray whales within the Piltun area is dynamic. During August, gray whales gravitate to the southern parts of the area whereas in September and October they tend to concentrate in northern parts. The causes of the local movements of gray whales within the Piltun feeding area remain unknown. However, short-term changes in local distribution have also been documented in studies of the eastern gray whale population (Calambokidis *et al*. 2002, Meier 2003, C. Tombach 2003 LGL Ltd. pers. comm.). Individual gray whales moving 50 km or more in 24 hours were observed, while other whales demonstrated strong site-fidelity (over days or weeks) to regions less than 500 m^2. Studies of a small number (~100 individuals) of feeding resident eastern gray whales in Clayoquot Sound, Canada (Bass 2000, Dunham and Duffus 2001, 2002) found that large within-season and between-season population shifts of gray whales in this area were correlated with the distribution and abundance of prey and little variability was a response to anthropogenic factors, such as the presence of whale-watching vessels, as was originally presumed by both the local and scientific communities (Duffus 1996). Dunham and Duffus (2001, 2002) and Meier (2003) found that during the feeding season these gray whales switched between six geographically discrete feeding sites and a total of 13 prey species (benthic, epibenthic, and planktonic) within the larger region of Clayoquot Sound when (1) the biomass in

one site decreased to a level where foraging was no longer energetically worthwhile, or (2) the biomass of prey was greater in an alternate site.

A number of benthic studies (Koblikov 1983, 1986; Kussakin *et al*. 2001; Fadeev 2002, 2003, 2004) have established that the shallow coastal waters near Piltun Bay support benthic organisms that may be suitable as prey for gray whales (Rice and Wolman 1971, Thomson 1983, Nerini 1984, Blokhin and Pavlyuchkov 1988). In particular, Fadeev (2002, 2003, 2004) found that at depths of 5 to 15 m, this area is characterized by an abundance of potential prey organisms, primarily amphipods and isopods. It has been speculated that seasonal redistribution of gray whales in the Piltun area may also be connected with the changes in distribution and availability of their prey (Yazvenko *et al.* 2002, Blokhin *et al.* 2003, Fadeev 2003). No data exists to date to support this speculation. However, benthic sampling in spots where western gray whales were feeding in 2002 and 2003 yielded consistently high levels of biomass of potential prey organisms, primarily amphipods (Fadeev 2003, 2004). This pattern is similar to that observed on eastern gray whales within the region of Clayoquot Sound.

Previous studies established that the majority of gray whales in the vicinity of Piltun Bay stay no farther than 4-5 km from shore (Blokhin *et al*. 1999; Blokhin and Burdin 2001; Blokhin *et al*. 2002; Sobolevsky 2000; Weller *et al*. 2002; Wursig *et al*. 1999, 2000). A similar distribution of gray whales was also observed in 2003, when most of them (80.4%) were recorded within a 3-km zone along the coast, or 90.2% within a 4-km zone (Figure 19.) if only full surveys were included.

The composition of the groups of gray whales recorded from the air did not change in comparison to previous years. Single individuals were always predominant among gray whales that were observed (Perlov *et al*. 2001; Blokhin *et al*. 2002).

In aerial surveys conducted in the Piltun area prior to 2001, no information was collected on the nature of gray whales' movement. Shore-based observations established that while feeding gray whales do not remain in one place long but move along the coast, either to the north or south (Blokhin 1996; Blokhin *et al*. 1999). In 2003, in August most of the whales (81%) were moving in a southerly direction (Figure 41) and also in August most of the gray whales were recorded in the southern part of the area (sectors 1 and 2, Figure 37, Figure 38). In October, the

opposite pattern was seen: most of the whales (68%) were swimming to the north and they were predominantly seen in the northern half of the area (sectors 4 and 5) (Figure 37, Figure 38, and Figure 41).

Survey effort and adjusted observed densities of gray whales

In spite of under-sampling of lines 3 and 4 in the data, the monthly distributions of raw sightings (Figure 11 - Figure 15) and computed relative densities of gray whales adjusted for survey effort (Figure 30 - Figure 33) are quite similar. This is likely due to the fact that lines 3 and 4 which were heavily under-sampled do not contribute an amount of sightings that would change the distribution pattern appreciably. The majority of gray whales stay within the 20-m isobath. The probable explanation of this fact lies in the distribution of potential prey. Recent data on gray whale feeding in the Piltun area (Fadeev 2002, 2003, 2004) suggest that the biomass of quality prey (Amhipoda) in the area peaks at 5-10 m isobaths and then quickly decreases with increasing depth. Because whale movements and locations are likely determined by the amount and quality of prey, it is only natural for gray whales in the Piltun area to stay nearshore.

Total computed average monthly numbers of whales (Figure 34) have a clear peak in September, compared with the unadjusted (raw) counts (Figure 18) which peak in August. The difference in survey effort is not dramatic: 6 h in August (89 gray whales sighted on-transect, or 14.83 whales/h) vs. 7.55 h in September (112 gray whales sighted on-transect, or 14.86 whales/hr, Figure 35, Table 7). The difference may be due to the fact that in September, 3 gray whales were sighted on-transect on lines 3 and 4, which is 60% of the total number of gray whales sighted on lines 3 and 4 for the season. These sightings in an area with low densities may have affected the resulting total density for September in such a conspicuous way.

Mother/calf pairs

It is not easy to distinguish a mother/calf pair from a fast moving aircraft. Therefore, their numbers as seen from the air are under-represented. Most known sightings of mother/calf pairs for the past several years were made in the southern portion of the Piltun feeding area (Würsig *et al*. 2000, Weller *et al*. 2001ab). Both sightings made on aerial surveys in 2003 were located in the northern portion of the Piltun feeding area in early-mid season.

Gray whale feeding

The summer habitats of the gray whale in all of the Far Eastern seas are places where they feed actively. When a gray whale is feeding on benthos, its feeding activity in a particular area can be determined by the presence or absence of mud plumes on the surface of the sea beside gray whales. These mud plumes can be seen especially well from the air. The frequency of occurrence of whales with mud plumes beside them began to be recorded during aerial surveys offshore of northeastern Sakhalin in 2001 and 2002 (Perlov *et al*. 2001; Blokhin *et al*. 2002). These observations were continued in 2003, and they showed that in the Piltun area this index of the whales' feeding activity was highest (48%) during the second survey (July). After that, it declined somewhat (to 33-38%), but whales with mud plumes beside them were noted all the way up until the end of October (Figure 44). A similar nature of change in this index of gray whales' feeding activity was also noted in the Piltun area in 2002 (Blokhin *et al*. 2002). This can apparently be explained by the fact that in the first months of their stay off the coast of Sakhalin, the whales begin to feed intensively, replenishing the fat that they have lost at their wintering places. Noteworthy is a low index of the gray whales' feeding activity recorded in sector 4 (Figure 45), where a high number of gray whales was sighted in the fall. This might be due to a number of possible reasons: the prey base in sector 4 may be less abundant than in other areas; the sediments may be more sandy, thus the mud plume would sink faster; or gray whales may feed more on a non-benthic food source in sector 4. American (California-Chukchi) gray whale population may periodically feed on epibenthic and plankton crustaceans in the Bering Sea (Nerini, 1984); as for the Vancouver Island 'population', its main food source is planktonic and epibenthic organisms (Bass 2000, Stelle 2001, Meier 2003). Studies of the whales' behavior in the Piltun area have made it possible to hypothesize that the whales may also eat food of non-benthic origin in these waters (Wursig *et al*. 2003).

Mean indices of the whales' feeding activity in the Piltun area in 2001, 2002 and 2003 are similar (Figure 66).

Offshore Feeding Area

Gray whale distribution and abundance

The aerial surveys conducted in 2003 continued the monitoring of the Offshore gray whale feeding area off the northeast coast of Sakhalin (Table 7, Table 9, Figure 53). In comparison to the previous season the number of gray whales sighted in the boundaries (based on data through the 2002 field season) of the Offshore area grid declined in 2003 (Figure 67). For example, the average number of gray whales recorded here during the period from July through September was 10.4 in 2002 and 8.25 in 2003. It is noteworthy that on 19 November, 2002, 18 gray whales were counted in the Offshore area (Blokhin *et al*. 2002), while in 2003 (29 November) only three whales were observed. There was also some redistribution of gray whales over the area: in 2001 and 2002 most of gray whales were observed in the northern and central parts of the area (Perlov *et al*., 2001; Blokhin *et al*., 2002, Yazvenko *et al*. 2002, Blokhin *et al*. 2003), while in 2003 most of them were in the southern half of it (Figure 68). Fewer whales were sighted on transects 7-9 in 2003 than in previous years (Table 9, Figure 47).

The season of 2003 was only the third year when the Offshore are was known and only the second year when it was monitored throughout the season. The 2003 data confirmed earlier observation that the Offshore area is a feeding ground used by whales throughout the entire period of gray whales' summering off the northeast coast of Sakhalin (Blokhin *et al*. 2003; Figure 72). In 2003 gray whales were sighted here in June and were present in the area until the end of November (Table 9).

The dynamics of the numbers of gray whales in these two feeding areas is similar in 2003: the maximum number was recorded in August; the lowest number, in November (Figure 17, Figure 53). The significant presence of whales in the Offshore area in November that was noted in 2001 (Yazvenko *et al.* 2002) and especially in 2002 (Blokhin *et al.* 2003) was not recorded in 2003.

The observations conducted in 2003 showed that the average number of whales from July-September in the Offshore area was lower than it was at the same time in the Piltun area (10 and 18 gray whales, respectively, Figure 72). The index of feeding activity did not change vs.

2002 (Figure 71). These data indicate that the Offshore area is as significant as the Piltun area as a feeding ground, and in late season it may even play a more important role.

Thus, the observations conducted in 2003 provided a somewhat different picture (in comparison to previous years) of the numbers and distribution of gray whales in the Offshore area: the numbers are lower than before (though there are no statistically significant difference) and the whales are distributed more to the south than before. Vessel-based surveys conducted in 2003 (Maminov 2004) found a large number of gray whales in August and September 2003 feeding at depths >60 m seaward of the eastern boundary of the Offshore area grid, which runs along 143°45′ E. Therefore, these animals were outside the range of view of the aerial observers. This is an important development underscoring again how mobile and flexible gray whales are (Blokhin *et al*. 1999, Bass 2000, Perlov *et al*. 2002, Meier 2003). Gray whales' presence on their feeding grounds is primarily controlled by the availability and distribution of prey; thus the eastern shift in distribution that has been noted in the Offshore area in 2003 may be due to a change in the distribution of their prey. The data obtained by the vessel-based observers in 2003 suggest a revision of our idea about the boundaries of the Offshore feeding area as an important gray whale habitat off the northeast coast of Sakhalin.

Gray whale feeding

The 2003 data confirmed the data from the previous two years indicating a similar level of gray whales' feeding activity in this area in the last two years (Figure 57, Figure 70, Figure 73).

The composition of the groups of whales sighted in the Offshore area did not differ from 2002 (Blokhin *et al*. 2003). The nature of the whales' orientation in this area was also unchanged in comparison to 2001 (Perlov *et al*., 2001; Blokhin *et al*., 2002).

The experience accumulated in the last three years of observations of the mud plumes that are formed in some cases beside a rising whale enables us to say that sighting these mud plumes may depend on many factors, primarily on the lighting and the angle/distance from the aircraft. A mud plume is formed when a whale rises to the surface and is located at various distances from the surface in the water column. Therefore, it should be easily visible on sunny days and

seen better, the higher the sun is above the horizon. Unfortunately, the small number of observations does not permit proper analysis. How long they last in upper layers of the water should also be greatly affected by the nature of sediment (sand vs. clay/silt) and sea state. Fine-grained sediments are more prevalent in the Offshore area compared with more sandy sediments in the Piltun area (Fadeev 2003, 2004).

Comparison of the data on feeding index in 2001, 2002 and 2003 (Figure 66, Figure 71), indicate unchanging level of gray whales' feeding activity throughout all three seasons when it was studied[2]. Aerial survey data suggest that the feeding conditions for gray whales off the northeast coast of Sakhalin have remained consistent over the last three seasons.

The dynamic distribution patterns of whales in the two feeding areas noted in 2001-2002, as well as in 2003, indicates that gray whales are constantly moving within these waters. Fluctuations of the number of whales within the two main feeding areas and sparse sightings of gray whales outside of them in 2001 and 2002 (Perlov *et al*., 2001, Blokhin *et al*., 2002) indicate that whales are to some extent moving between the Piltun and Offshore feeding areas during their summering season. Photo-identification studies provide direct evidence to corroborate this speculation: in 2000, out of three gray whales photographed in the Offshore area whose identity could be established, all three were previously seen in the Piltun area (Weller *et al*. 2002). In 2002, 9 out of 10 individual gray whales identified in the Offshore area had previously been observed and photo-identified in coastal waters near Piltun Bay (Weller *et al*. 2002). New photo-identification data (Yakovlev and Tyurneva 2003, 2004) suggest the same phenomenon.

While the fact of exchange between the two feeding areas has been established, data on the intensity or speed of such exchange is limited. In 2003, IBM's photo-identification team had photographed an individual gray whale in Piltun area, then twice in the Offshore area and again in the Piltun area, all within one month (Yakovlev and Tyurneva 2004). Based on aerial survey data, the exchange between the two areas is either modest or the movement between the areas is very fast, because the number of sightings of gray whales "on their way" between the areas is very limited.

[2] The comparative data for the Offshore feeding area (Fig. 71) do not include 2001 because this area was discovered and studied only late in the season of 2001 and comparison with later seasons is considered inappropriate.

Lunskoye grid area

No gray whale sightings were made in the Lunskoye grid area in 2003. On 28 July 2002, four gray whales were sighted on within the grid (Blokhin *et al*. 2003). In August-September 2003, marine mammal observers who were engaged in a mitigation program for the 3-D seismic survey in the area, sighted several gray whales feeding along the coast at 15-35 m isobaths between 51º30'N and 51º45N (A. Aschepkov, *pers. comm.,* 2003). These observations indicate that the area adjacent to the Lunski Bay may be yet another feeding area of gray whales. More data is needed to clarify this issue.

CONCLUSIONS

The aerial surveys of marine mammals conducted in coastal waters of northeastern Sakhalin in 2003 were part of a long-term international program to study marine mammals in this region. The work was conducted by researchers from the laboratory of marine mammals at TINRO-Center (Vladivostok) with financial support from the Exxon Neftegas Ltd. and Sakhalin Energy Investment Company Ltd.

1. Six sets, or rounds, of aerial surveys were conducted in an An-28 aircraft from June through December, totaling 83.5 net survey flight hours. The following results were obtained.

2. As in previous years of aerial surveys, gray whales were the most numerous representatives of large cetaceans recorded in 2003 offshore of northeastern Sakhalin.

3. Other than gray whales, 20 minke whales, 17 killer whales, two Baird's beaked whales, one fin whale and two unidentified whales were sighted.

4. The two spatially distinct feeding areas (Piltun feeding area and the Offshore feeding area) of western gray whales off the northeast coast of Sakhalin were the specific focus of the study.

5. The number of gray whales recorded on-transect from June through early December was not constant: the maximum number of gray whales in the Piltun area (27), as well as in the Offshore area (9), was noted in August; the observed numbers in June and November were low.

6. As in previous years, in 2003 the majority of gray whales in the Piltun area stayed in a narrow strip of coastal waters, no farther than 4-5 km from shore. In August, gray whales gravitated to the southern parts of the area; in the fall (September-October), more whales chose the northern parts.

7. Two years of observations have confirmed that the Offshore area is a gray whale habitat throughout the entire feeding/summering season in the coastal waters of northeastern Sakhalin.

8. In 2003, gray whales gravitated to the southern half of the Offshore area, as opposed to 2001 and 2002, when more whales stayed in central and northern portions of the area.

9. Comparison of aerial survey data and vessel-based survey data in 2003 indicates that some gray whales shifted east into deeper waters (>60m isobaths) and outside of the Offshore area survey grid.

10. Gray whales' feeding activity was high in the Offshore area in 2003, as in 2001 and 2002. This is an indication that the Offshore area is very significant as a feeding ground of gray whales.

The Piltun and Offshore areas of the coastal waters of northeastern Sakhalin are presently the only known areas where the Western population of gray whales feeds in the Sea of Okhotsk. The low estimated number of western gray whales and the proximity of their feeding grounds to oil and gas development areas along the coast of northeastern Sakhalin warrant the need to continue monitoring of the status of this population.

REFERENCES

Bass, J. 2000. Variations in gray whale feeding behaviour in the presence of whale-watching vessels in Clayoquot Sound, 1993-1995. Ph.D. Dissertation. Department of Geography, University of Victoria, Victoria, British Columbia, Canada. 156 p.

Berzin, A.A. 1974. Practical Issues in the study of whales (using the example of Pacific whales), Zoologiya Pozvonochnykh [Vertebrate Zoology]. Vol. 6. Pp. 159-189 (in Russian).

Berzin, A.A., V.L. Vladimirov and N.V. Doroshenko. 1990. Aerial surveys of the distribution and abundance of bowhead, gray, and white whales in the Sea of Okhotsk between 1985 and 1989. Izv. TINRO, vol. 112, pp. 51-60 (in Russian).

Berzin, A.A., V.L. Vladimirov, and N.V. Doroshenko. 1991. Results of aerial surveys to study the distribution and abundance of whales in the Sea of Okhotsk in 1988-1990. Pages 6-17 In: L.A. Popov (ed.), All-Union Scientific Research Institute of Fisheries and Oceanography (VNIRO), Moscow, Russia (in Russian).

Berzin, A.A., V.L. Vladimirov, and N.V. Doroshenko. 1988. Results of Airborne Observations to Study the Distribution and Abundance of Cetaceans in Coastal Waters of the Sea of Okhotsk, 1986 - 1987. // Scientific research work on marine mammals in the northern part of the Pacific Ocean, 1986/1987. Ed. L.A. Popov. Moscow. VNIRO. pp. 18-28.

Blokhin, S.A. 1996. Distribution, numbers and behavior of gray whales (*Eschrichtius robustus*) of the American and Western populations in the areas of their distribution off the coasts of the Far East, Izv. TINRO. vol. 121, pp. 36-53 (in Russian).

Blokhin, S.A. and A.M. Burdin. 2001. The distribution, abundance, and some behavior features of gray whale (*Eschrichtius robustus*) from the Western population at the northeast Sakhalin coast. Biol. Morya (Vladivostok), vol. 27, no. 1, pp. 15-20 (in Russian).

Blokhin, S. A., A.A. Pavlyuchkov. 1988. Feeding of gray whales of the California-Chukotka population in waters of the Chukotka Peninsula in 1980, Research on marine mammals of the Northern Pacific Ocean in 1980-1988. Moscow. Pp. 24-37 (in Russian).

Blokhin, S.A., N.V. Doroshenko and I.P. Marchenko. 2003. The abundance, distribution, and movement patterns of gray whales (*Eschrichtius robustus*) in coastal waters off the northeast Sakhalin Island coast in 2002 based on the aerial survey data. Report by

TINRO Centre, Vladivostok, Russia, for Exxon Neftegas Limited and Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russia (in Russian). [available on the Sakhalin Energy Investment Company website]

Blokhin, S.A., Yu.V. Ivashchenko and A.M. Burdin. 1999. The abundance and distribution of gray whale (*Eschrichtius robustus*) at the northeast Sakhalin coast. Izv. TINRO, 1999, vol. 126, pp. 424-433 (in Russian).

Blokhin, S.A., M.K. Maminov and G.M. Kosygin. 1985. On the Korean-Okhotsk population of gray whales. Rep. Int. Whal. Commun.- No 35.- p. 375-376.

Blokhin, S.A., S.B. Yazvenko V.L. Vladimirov and S.I. Lagerev. 2002. The abundance, distribution, and behavior of gray whale (*Eschrichtius robustus*) in coastal waters of the northeast Sakhalin during the summer-fall period of 2001 (from aerial survey data). Marine Mammals of Holarctic: Proceedings of the 2nd International Conference, Baikal, Russia, pp. 36-38.

Borovikov, V. 2001. STATISTICA: the art of computer data analysis. For professionals. St. Petersburg: Piter. 656 pp. (in Russian).

Brownell, R.L. (Jr.), and C. Chun. 1977. Probable existence of the Korean stock of gray whales (*Eschrichtius robustus*). J. Mammalogy 58: 237-239.

Calambokidis, J., J.D. Darling, V. Deeke, P. Gearin, M. Gosho, W. Megill, C.M. Tombach, D. Goley, C. Toropova and B. Gisborne. 2002. Abundance, range and movements of a feeding aggregation of gray whales (*Eschrichtius robustus*) from California to southeastern Alaska in 1998. J. Cet. Res. Manage. 4(3):267-276.

Duffus, D.A. 1996. The recreational use of gray whales in southern Clayoquot Sound, Canada. Applied Geography 16:179-190.

Dunham, J.S. and D.A. Duffus. 2001. Foraging patterns of gray whales in central Clayoquot Sound, British Columbia. Mar. Ecol. Prog. Ser. 223:299-310.

Dunham, J.S. and D.A. Duffus. 2002. Diet of gray whales (*Eschrichtius robustus*) in Clayoquot Sound, British Columbia, Canada. Mar. Mamm. Sci. 18(2):419-437.

Fadeev, V.I. 2002. Benthic Research in the Feeding Area of the Western Gray Whale in 2001. Report by the Institute of Marine Biology, Far East Branch of Russian Academy of

Sciences, Vladivostok, Russia, for Exxon Neftegas Limited and Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russia. 99 pp. [available on the Sakhalin Energy Investment Company website]

Fadeev, V.I. 2003. Benthos and Prey Studies in Feeding Grounds of the Okhotsk-Korean Population of Gray Whales. Report on materials from field studies on the research vessel Nevelskoy in 2002. Report by the Institute of Marine Biology, Far East Branch of Russian Academy of Sciences, Vladivostok, Russia, to Exxon Neftegas Limited and Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russia. 118 pp. [available on the Sakhalin Energy Investment Company website]

Fadeev, V.I. 2004. Benthos and Prey Studies in Feeding Grounds of the Okhotsk-Korean Population of Gray Whales. Report on materials from field studies on the research vessel Nevelskoy in 2003. Report by the Institute of Marine Biology, Far East Branch of Russian Academy of Sciences, Vladivostok, Russia, to Exxon Neftegas Limited and Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russia. 191 pp.

Gailey, G., O. Sychenko and B. Würsig. 2004. Western gray whale occurrence patterns and behavior: shore-based observations off Sakhalin Island, July-September 2003. Report by for Sakhalin Energy Investment Company and Exxon Neftegas Limited, Yuzhno-Sakhalinsk, Russia. 74 pp.

High Energy Seismic Survey Team. HESS. 1999. High energy seismic survey review process and interim operational guidelines for marine surveys offshore southern California. Report by HESS for The California State Lands Commission and the U.S. Minerals Management Service, Pacific Outer continental Shelf Region. Camarillo, California. Available at www.mms.gov.omm/pacific/lease/fullhessrept.pdf

Hilton-Taylor, C. 2000. IUCN Red List of Threatened Species. International union for the conservation of Nature and natural Resources, Species Survival Commission. Gland, Switzerland and Cambridge, United Kingdom. [Available from http://www.redlist.org/]

Koblikov, V. N. 1983. Quantitative Characteristics of the Bottom Population of Waters of the Sea of Okhotsk Near Sakhalin // Quantitative and Qualitative Distribution of Benthos: Food Supply for Benthos-Eating Fish. Moscow: VNIRO, 1983, pp. 4-21.

Koblikov, V. N. 1986. Benthic Communities on the Continental Shelf and Upper Part of the Slope of the Okhotsk Coast of Sakhalin Island. TINRO. Manuscript depos. 54 pp.

Kussakin, O.G., E.I. Sobolevsky, and S.A. Blokhin. 2001. A Review of Benthos Investigations on the Shelf of the Northeast Sakhalin. Report by the Institute of Marine Biology, Far East Branch of Russian Academy of Sciences, Vladivostok, Russia, to Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russia. 91 pp. (in Russian). [available on the Sakhalin Energy Investment Company website]

LeDuc, R.G., D.W. Weller, A.M. Burdin, J. Hyde, B. Würsig, R.L. Brownell, Jr., and A.E. Dizon. 2002. Genetic differences between western and eastern gray whales. J. Cetacean Res. Manage. 4(1):1-6.

Lerczak, J.A. and R.C. Hobbs. 1998. Calculating sighting distances from angular readings during shipboard, aerial, and shore-based marine mammal surveys. Mar. Mamm. Sci., 14: 590-599.

Maminov, M.K. and Y.M. Yakovlev. 2002. New data on the distribution and abundance of gray whales on the northeast Sakhalin shelf. Marine Mammals of Holarctic: Proceedings of International Conference, Baikal, Russia, pp. 170-171.

Maminov, M. 2004. Vessel-based marine mammal monitoring in the northeast Sakhalin Island, Okhotsk Sea, Russia. Report by TINRO-Center for Exxon Neftegas Limited and Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russia. 38 p + Append.

Meier, S.K. 2003. A multi-scale analysis of habitat use by gray whales (*Eschrichtius robustus*) in Clayoquot Sound, British Columbia, 1997-99. Masters Thesis, University of Victoria, Department of Geography, Victoria, B.C. 151 pp.

Miyashita, T., S. Nishiwaki, V.A. Vladimirov and N.V. Doroshenko. 2001. Paper SC/53/RMP5 presented to the IWC Scientific Committee, July (unpublished). 12 pp.

Nerini, M. 1984. A review of gray whale feeding ecology. In The Gray Whale, (Eschrichtius robustus). M.L. Jones, S.L. Swartz and S. Leatherwood (eds). Academic Press, Inc., Orlando, Flordia, pp.451-463.

Perlov, A.S. and M.K. Maminov. 2003. Abundance, Distribution, and Behavior of Gray Whales (*Eschrichtius robustus*) Offshore North-Eastern Sakhalin in 2002. Report by TINRO Centre, Vladivostok, Russia, to Exxon Neftegas Limited and Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russia, 15 pp. + Tables and Appendices. [available on the Sakhalin Energy Investment Company website]

Perlov, A.S., S.A. Blokhin and M.K. Maminov. 2002. The abundance, distribution, and behavior of gray whale at the northeast Sakhalin in July-November, 2001 (from aerial and ship-based surveys): an interim report. TINRO Archive, no. 24294, Vladivostok (in Russian).

Perlov, A.S., V. Vladimirov, Z.V. Reviakina, J. Ismail-Zade, S. Yazvenko and S.R. Johnson. 1996. Review of literature/information regarding marine mammals in the vicinity of Sakhalin Island, Okhotsk Sea, Russia. Report from Pacific Research Institute of Fisheries and Oceanography (TINRO), State Committee for Fisheries and Oceanography, Vladivostok, Russia and LGL Limited, environmental research associates, Sidney B.C. for Marathon Oil Company, Littleton, CO. 32 p. [available on the Sakhalin Energy Investment Company website]

Perlov, A.S., S.A. Blokhin and M.K. Maminov. 2002. The abundance, distribution, and behavior of gray whale at the northeast Sakhalin in July-November, 2001 (from aerial and ship-based surveys): an interim report. TINRO Archive, no. 24294, Vladivostok.

Red Book of the Russian Federation (Animals). 2001. [Krasnaya Kniga Rossiiskoi Federatsii. Zhivotnye]. Ast and Astrel - Balashikha, Aginskoe, 862 p. (in Russian).

Rice, D.W. and A.A. Wolman. 1971. The life history and ecology of the gray whale (*Eschrichtius robusttus*), Spec. Publ. –Amer. Soc. Mammal. V. 3. Pp. 1-143.

Richardson, W.J. and M.T. Williams. (eds.) 2000. Monitoring of ringed seals during construction of ice roads for BP's Northstar oil development, Alaskan Beaufort Sea, 1999. Final Report from LGL Ltd., King City, Ont., and LGL Alaska Res. Assoc. Inc., Anchorage, AK, for BP Explor. (Alaska) Inc., Anchorage, AK, and Nat. Mar. Fish. Serv., Anchorage, AK, and Silver Spring, MD. xiv + 153 p.

Sobolevsky, E.I. 1998. Observations on the behavior of *Eschrichtius gibbosus* Erxl., 1777 on the shelf of north eastern Sakhalin. Russian Journal of Ecology 29: 103-108.

Sobolevsky, E.I. 2000. Current abundance and distribution pattern of gray whales on the northeast Sakhalin shelf. Marine Mammals of Holarctic: Proceedings of International Conference, Arkhangel'sk, Russia, pp. 350-352.

Sobolevsky, E.I. 2001. Marine Mammals Studies Offshore North East Sakhalin in 2000. Report by the Institute of Marine Biology, Far East Branch of Russian Academy of

Sciences, Vladivostok, Russia, to Exxon Neftegas Limited and Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russia. 144 pp. [available on the Sakhalin Energy Investment Company website]

Sobolevsky, E.I. 2001. Marine Mammals Studies Offshore North East Sakhalin in 2000. Report by the Institute of Marine Biology, Far East Branch of Russian Academy of Sciences, Vladivostok, Russia, to Exxon Neftegas Limited and Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russia. 144 pp.

Spjotvoll, E. and M.R. Stoline. 1973. An extension of the t-method of multiple comparison to include the cases with unequal sample sizes. Journal of the American Statistical Association 68: 975-978.

Stelle. L.L. 2001. Behavioral ecology of gray whales (*Eschrichtius robustus*) feeding on mysids in British Columbia, Canada. PhD thesis. Dept. of Ecology, Evolution, and Organismal Biology, UCLA.

Thomson, D.H. (editor). 1983. Feeding ecology of gray whales (*Eschrichtius robustus*) in the Chirikof Basin, summer 1982. Report by LGL Alaska Research Associates for U.S. Department of Commerce, NOAA/OCSEAP Final Report 43(1986):209-460.

Vladimirov, V.L. 1994. The current distribution and abundance of whales in the Far East seas. Biol. Morya (Vladivostok), vol. 20(1):3-13.

Weller, D.W., A.L. Bradford, A.M. Burdin, T. Miyashita, T. Kariya, A.M. Trukhin, S.A. MacLean, V.A. Vladimirov and N.V. Doroshenko. 2002a or b. Photographic recaptures of western gray whales in the sea of Okhotsk, Paper SC/54/BRG13 of the Scientific Committee of the International Whaling Commission, 5 pp.

Weller, D.W., A.M. Burdin, A.L. Bradford and B. Würsig. 2001a. Gray Whales off Sakhalin Island, Russia: June-September 2000. A Joint U.S. - Russian Scientific Investigation. Report by Texas A&M University and Kamchatka Institute of Ecology and Nature Management, for Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russia. 56 pp. [available on the Sakhalin Energy Investment Company website]

Weller, D.W., A.M. Burdin and R.L. Brownell, Jr. 2003. Western Gray Whales off Sakhalin Island, Russia: Interim for 2003 Field Studies. Report for International Fund for Animal Welfare and International Whaling Commission by Southwest Fisheries Science Center,

La Jolla, CA, Kamchatka Branch of Pacific Institute of Geography, Petropavlovsk, Russia, and the Alaska Sealife Center, Seward, AK. 8 pp.

Weller, D.W., A.M. Burdin, A.L. Bradford, G.A. Tsidulko and Y.V. Ivashchenko. 2002 a or b. Gray whales off Sakhalin Island, Russia: June-September 2001. A Joint U.S. – Russia Scientific Investigation. Report by Texas A&M University, College Station, TX, and Kamchatka Institute of Ecology and Nature Management, Russian Academy of Sciences, Petropavlosk-Kamchatkii, Russia, for Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russia, 51 pp. [available on the Sakhalin Energy Investment Company website]

Weller, D.W., S.H. Reeve, A.M. Burdin, B. Würsig and R.L. Brownell, Jr. 2002. A note on the spatial distribution of western gray whales (*Eschrichtius robustus*) off Sakhalin Island, Russia in 1998. J. Cet. Res. Manage. 4(1):13-17.

Weller, D.W., B. Würsig, A.M. Burdin, S.H. Reeve and A.L. Bradford. 2000. Gray Whales off Sakhalin Island, Russia: June - October 1999. A Joint U.S. - Russian Scientific Investigation. Report by Texas A&M University and Kamchatka Institute of Ecology and Nature Management, for Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russia. 65 pp. [available on the Sakhalin Energy Investment Company website]

Weller, D.W., B. Würsig, A.L. Bradford, A.M. Burdin, S.A. Blokhin and R.L. Brownell, Jr. 1999. Gray whales (*Eschrichtius robustus*) off Sakhalin Island, Russia: seasonal and annual patterns of occurrence. Mar. Mammal Sci. 15(4): 1208-27.

Weller, D.W., S.H. Reeve, A.M. Burdin, B. Würsig and R.L. Brownell, Jr. 2002. A note on the spatial distribution of western gray whales (*Eschrichtius robustus*) off Sakhalin Island, Russia in 1998, J. Cetacean res. Manage., 4(1), pp. 13-17.

Würsig, B., G. Gailey, T. McDonald, R. Nielson, J.G. Ortega-Ortiz, P. Wainwright, M. Jenkerson, O. Sychenko, K. Tarasyan and N. Brown. 2002. Western gray whale occurrence patterns and behavior: Shore-based observations off Sakhalin Island, August-September 2001. Report by Texas A&M University, College Station, TX and Kamchatka Institute of Ecology and Nature Management, Russian Academy of Sciences, Kamchatka, Russia, for Exxon-Neftegas Limited, Yuzhno-Sakhalinsk, Russia.

Würsig, W., G. Gailey, O. Sychenko and H. Peterson. 2003. Western gray whale occurrence patterns and behavior: shore-based observations off Sakhalin Island, August-September

2002. Report by Texas A&M University, College Station, TX, for Sakhalin Energy Investment Company and Exxon Neftegas, Yuzhno-Sakhalinsk, Russia. 48p. [available on the Sakhalin Energy Investment Company website]

Würsig, B., D.W. Weller, A.M. Burdin, S.A. Blokhin, S.Y. Reeve, A.L. Bradford and R.L. Brownell, Jr. 1999. Gray whales summering off Sakhalin Island, Far East Russia: July-October 1997. A Joint U.S. - Russian Scientific Investigation. Report by Texas A&M University and Kamchatka Institute of Ecology and Nature Management, for Sakhalin Energy Investment Company and Exxon Neftegas Limited, Yuzhno-Sakhalinsk, Russia. 101 pp. [available on the Sakhalin Energy Investment Company website]

Würsig, B., D.W. Weller, A.M. Burdin, S.Y. Reeve, A.L. Bradford, S.A. Blokhin and R.L. Brownell, Jr. 2000. Gray Whales summering off Sakhalin Island, Far East Russia: June-September 1988. A Joint US-Russia scientific investigation. Report by Texas A&M University and the Kamchatka Institute of Ecology and Nature Management for Sakhalin Energy Investment Company and Exxon Neftegas Limited, Yuzhno-Sakhalinsk, Russia. 133 pp. [available on the Sakhalin Energy Investment Company website]

Yakovlev, Yu.M. and O. Tyurneva. 2003. Photo-identification of the Korean-Okhotsk gray whale (*Eschrichtius robustus*) population in 2002. Report by the Institute of Marine Biology, Far East Branch of Russian Academy of Sciences, Vladivostok, Russia, for Exxon Neftegas Limited and Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russia. 30 pp. [available on the Sakhalin Energy Investment Company website]

Yakovlev, Yu.M. and O. Tyurneva. 2004. Photo-identification of the Korea-Okhotsk gray whale (*Eschrichtius robustus*) population along the northeast coast of Sakhalin Island, Russia, 2003. Report by the Institute of Marine Biology, Far East Branch of Russian Academy of Sciences, Vladivostok, Russia, for Exxon Neftegas Limited and Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russia. 52 pp.

Yazvenko, S., T. MacDonald, S.K. Meier, S. Blokhin, S.R. Johnson, V. Vladimirov, S. Lagerev, M. Maminov, E. Razlivalov and M. Newcomer. 2002. Aerial marine mammal monitoring during the 2001 3-d seismic survey of Odoptu block, northeast Sakhalin Island, Okhotsk Sea, Russia. Report by LGL Limited environmental research associates, Sidney, BC, for Exxon Neftegas Limited, Yuzhno-Sakhalinsk, Russia. 163 p.

TABLES

Table 1. Grid points in Piltun grid.

Transect number	Transect point	Longitude	Latitude
4	4.6	143.2028	53.51089
3	3.6	143.1725	53.50922
2	2.6	143.1425	53.50727
1	1.6	143.1125	53.50561
4	4.5	143.302	53.34811
3	3.5	143.2723	53.34645
2	2.5	143.2423	53.34478
1	1.5	143.2123	53.34283
4	4.4	143.3567	53.21144
3	3.4	143.3267	53.2095
2	2.4	143.297	53.20784
1	1.4	143.2673	53.20617
4	4.3	143.3962	53.04589
3	3.3	143.3665	53.04422
2	2.3	143.3367	53.04256
1	1.3	143.307	53.04089
4	4.2	143.4256	52.89534
3	3.2	143.3959	52.89367
2	2.2	143.3662	52.892
1	1.2	143.3367	52.89006
4	4.1	143.4287	52.72256
3	3.1	143.3993	52.72089
2	2.1	143.3698	52.71922
1	1.1	143.3404	52.71756

Table 2. Grid points in Offshore grid.

Transect number	Transect point	Longitude	latitude
1	1.1	143.38339	51.88049
1	1.2	143.38306	52.41976
2	2.1	143.42696	51.88050
2	2.2	143.42716	52.41976
3	3.1	143.47053	51.88049
3	3.2	143.47125	52.41974
4	4.1	143.51410	51.88046
4	4.2	143.51535	52.41971
5	5.1	143.55766	51.88042
5	5.2	143.55945	52.41966
6	6.1	143.60123	51.88036
6	6.2	143.60355	52.41959
7	7.1	143.64480	51.88028
7	7.2	143.64764	52.41951
8	8.1	143.68836	51.88019
8	8.2	143.69174	52.41941
9	9.1	143.73192	51.88008
9	9.2	143.73583	52.41929

Table 3. Grid points in the Lunskoye area grid.

Transect	Segment	Longitude	Latitude
1	1.1	143.60154	51.04734
1	1.2	143.54459	51.21432
1	1.3	143.48725	51.38128
1	1.4	143.42952	51.54821
1	1.5	143.33642	51.70886
1	1.6	143.24268	51.86945
2	2.1	143.62943	51.05110
2	2.2	143.57242	51.21856
2	2.3	143.51502	51.38600
2	2.4	143.45717	51.55340
2	2.5	143.36390	51.71452
2	2.6	143.26998	51.87557
3	3.1	143.65732	51.05485
3	3.2	143.60025	51.22280
3	3.3	143.54279	51.39071
3	3.4	143.48482	51.55858
3	3.5	143.39138	51.72017
3	3.6	143.29729	51.88169
4	4.1	143.68522	51.05860
4	4.2	143.62809	51.22702
4	4.3	143.57056	51.39542
4	4.4	143.51249	51.56376
4	4.5	143.41888	51.72582
4	4.6	143.32461	51.88781
5	5.1	143.71312	51.06234
5	5.2	143.65593	51.23124
5	5.3	143.59834	51.40011
5	5.4	143.54016	51.56893
5	5.5	143.44637	51.73146
5	5.6	143.35193	51.89391
6	6.1	143.74103	51.06608
6	6.2	143.68378	51.23546
6	6.3	143.62613	51.40481
6	6.4	143.56847	51.57296
6	6.5	143.47388	51.73709
6	6.6	143.37927	51.90002
7	7.1	143.76894	51.06981
7	7.2	143.71163	51.23966
7	7.3	143.65392	51.40949
7	7.4	143.59628	51.57790
7	7.5	143.50139	51.74271
7	7.6	143.40661	51.90611
8	8.1	143.79685	51.07353
8	8.2	143.73949	51.24386
8	8.3	143.68172	51.41417
Transect	Segment	Longitude	Latitude
8	8.4	143.62410	51.58282
8	8.5	143.52891	51.74833
8	8.6	143.43395	51.91220
9	9.1	143.82477	51.07725
9	9.2	143.76735	51.24806
9	9.3	143.70952	51.41884
9	9.4	143.65192	51.58774
9	9.5	143.55643	51.75394
9	9.6	143.46131	51.91828
10	10.1	143.85269	51.08095
10	10.2	143.79521	51.25224
10	10.3	143.73733	51.42351
10	10.4	143.67975	51.59265
10	10.5	143.58397	51.75955
10	10.6	143.48867	51.92435
11	11.1	143.88062	51.08466
11	11.2	143.82308	51.25642
11	11.3	143.76514	51.42817
11	11.4	143.70758	51.59755
11	11.5	143.61150	51.76515
11	11.6	143.51604	51.93042
12	12.1	143.90855	51.08835
12	12.2	143.85096	51.26060
12	12.3	143.79296	51.43282
12	12.4	143.73541	51.60245
12	12.5	143.63905	51.77074
12	12.6	143.54341	51.93648

Table 4. Grid points in the Extensive survey grid.

Transect number	Transect point	Longitude	Latitude
1	1.0	143.62000	51.00650
1	1.1	144.18900	51.00650
2	2.0	143.59000	51.10000
2	2.1	144.18900	51.10000
3	3.0	143.55500	51.19030
3	3.1	144.12941	51.18960
4	4.0	143.52000	51.27930
4	4.1	144.13002	51.27855
5	5.0	143.48700	51.36770
5	5.1	144.07100	51.36770
6	6.0	143.46400	51.45590
6	6.1	144.07100	51.45590
7	7.0	143.43300	51.54490
7	7.1	144.00669	51.54421
8	8.0	143.39100	51.63390
8	8.1	144.00621	51.63316
9	9.1	143.94200	51.72040
10	10.0	143.29400	51.80750
10	10.1	143.94200	51.80750
11	11.0	143.23500	51.89450
11	11.1	143.89276	51.89348
12	12.0	143.20300	51.98390
12	12.1	143.89245	51.98283
13	13.0	143.17457	52.07060
13	13.1	143.84200	52.07060
14	14.0	143.15529	52.16000
14	14.1	143.84200	52.16000
15	15.0	143.16545	52.25290
15	15.1	143.84200	52.25290
16	16.0	143.21500	52.34640
16	16.1	143.84200	52.34640
17	17.0	143.29400	52.43900
17	17.1	143.90900	52.43900
18	18.0	143.32500	52.53080
18	18.1	143.90900	52.53080
19	19.0	143.33662	52.62180
19	19.1	143.92400	52.62180
20	20.0	143.33860	52.71270
20	20.1	143.92400	52.71270
21	21.0	143.34335	52.80350
21	21.1	143.93500	52.80350
22	22.0	143.33700	52.89410
22	22.1	143.93500	52.89410
23	23.0	143.31700	52.98250
23	23.1	143.90614	52.98250
24	24.0	143.30200	53.07240
24	24.1	143.90646	53.07240
25	25.0	143.28000	53.16140
25	25.1	143.87800	53.16140
26	26.0	143.25200	53.25020
26	26.1	143.87800	53.25020
27	27.0	143.21000	53.34030
27	27.1	143.81101	53.33956
28	28.0	143.16100	53.42680
28	28.1	143.81171	53.42600
29	29.0	143.10500	53.51370
29	29.1	143.74500	53.51370
30	30.0	143.05300	53.60150
30	30.1	143.74500	53.60150
31	31.0	143.00100	53.68890
31	31.1	143.66645	53.68790
32	32.0	142.95000	53.77490
32	32.1	143.66765	53.77382
33	33.0	142.90900	53.86480
33	33.1	143.58600	53.86480
34	34.0	142.90900	53.95420
34	34.1	143.58600	53.95420

Table 5. Information recorded by observers during aerial surveys in all survey grids, 2001.

Marine Mammal Sighting Data	Survey Data
TIME: Time of sighitng, hh:mm:ss GPS: GPS waypoint in degrees:min:sec SPECIES: Species of marine mammal TYPE: If gray whales, the type of observation: whale(s) associated with plumes, whale(s) not associated with plumes, plumes not associated with whales NUMBER: Number of individuals sighted PLUMES: Number of mud feeding plumes if present ORIENTATION OR DIRECTION OF MOVEMENT OF WHALE(S): Estimated clock direction relative to aircraft GROUP TYPE: Single, adult-calf, pod CLINOMETER: Vertical angle (in percent) to the sighted whales(s) OTHER COMMENTS	LOCAL DATE: dd:mm:yy SURVEY START AND END TIME: hh:mm:ss AIRCRAFT TYPE: MI-8 helicopter or AN-28 fixed-wing aircraft SURVEY ALTITUDE: Meters above sea level (ASL) FLIGHT DIRECTION: Compass heading from survey pilots and intervals TRANSECT SEGMENT START AND END TIME: hh:mm:ss WAVE HEIGHT: Measured in meters, every 3 hrs from the Molikpaq. SWELL HEIGHT: Measured in meters, every 3 hrs from Molikpaq. WIND DIRECTION AND SPEED: Estimated degrees and kts obtained from the survey pilots at intervals along each transect. LATERAL VISIBILITY (of sea surface): 5 > 10 km; 4 = 1000 m; 3 = 600 m; 2 = 300 m; 1 = directly under the aircraft; 0 = zero. WHITE CAP INDEX: 0 = no white caps; 1 = solitary white caps; 2 = significant white caps limiting whale detectability. FOG: 1A >50% of the transect segment was partially obscured by haze; 1B >30% of the segment obscured by heavy fog; 2 >50% of the transect segment obscured by heavy fog. GLARE: 0 or 1, with 1=significant glare limiting whale detectability. CLOUD COVER (OVERCAST): Estimated in 10ths obscuration of the sky OTHER COMMENTS

Table 6. Summary table of aerial surveys along the coast of NE Sakhalin in 2003.

Case	Date	Type of survey	Lines flown	Survey in day	Full survey	Survey ID	Survey start	Survey end	Duration
1	5-Jun-04	Piltun	4,1,3,2	1	Y	1	16:01:27	17:58:49	1:57:22
2	6-Jun-04	Piltun	1	1		2	9:05:22	9:34:52	0:29:30
3	6-Jun-04	Piltun	2	1		2	12:43:50	13:06:42	0:22:52
4	6-Jun-04	Offshore	9-3	2	Y	3	9:46:48	12:14:15	2:27:27
5	7-Jun-04	Piltun	1	1	Y	4	9:45:29	10:12:11	0:26:42
6	7-Jun-04	Piltun	2	1	Y	4	13:03:36	13:29:46	0:26:10
7	7-Jun-04	Piltun	3	1	Y	4	14:30:59	14:57:41	0:26:42
8	7-Jun-04	Piltun	4	1	Y	4	17:06:59	17:33:23	0:26:24
9	7-Jun-04	Offshore	2	2		5	12:39:59	12:53:55	0:13:56
10	7-Jun-04	Offshore	5,6	2		5	15:07:54	16:56:22	1:48:28
11	7-Jun-04	Lunskoye	1,3,5,7	3	Y	6	10:41:35	12:38:24	1:56:49
12	7-Jun-04	Lunskoye	9,11	3	Y	6	15:32:00	16:33:26	1:01:26
13	5-Jul-04	Piltun	4,1,3,2	1	Y	7	11:05:40	13:01:22	1:55:42
14	8-Jul-04	Piltun	2	1		8	9:07:35	9:38:50	0:31:15
15	8-Jul-04	Piltun	1	1		8	12:41:21	13:06:57	0:25:36
16	8-Jul-04	Offshore	9-1	2	Y	9	9:52:58	12:32:14	2:39:16
17	8-Jul-04	Extensive	34-27	3		10	14:23:16	16:39:59	2:16:43
18	9-Jul-04	Extensive	26-15	1		10	9:31:36	12:45:30	3:13:54
19	9-Jul-04	Extensive	14-11	1		10	15:10:34	16:20:54	1:10:20
20	9-Jul-04	Piltun	2	2		11	12:57:17	13:20:43	0:23:26
21	9-Jul-04	Piltun	1	2		11	14:19:19	14:52:55	0:33:36
22	9-Jul-04	Piltun	1	3		12	16:39:34	16:55:00	0:15:26
23	10-Jul-04	Piltun	2	1		13	9:11:45	9:44:52	0:33:07
24	10-Jul-04	Lunskoye	1	2		14	10:17:55	10:30:18	0:12:23
25	15-Jul-04	Piltun	2	1		15	9:11:34	9:34:47	0:23:13
26	15-Jul-04	Piltun	1	1		15	12:29:53	13:11:55	0:42:02
27	15-Jul-04	Piltun	1	1		16	14:13:57	14:45:20	0:31:23
28	15-Jul-04	Piltun	2	1		16	16:36:31	17:04:23	0:27:52
29	15-Jul-04	Offshore	7	2		17	9:52:53	10:11:44	0:18:51
30	15-Jul-04	Offshore	6	2		17	12:13:51	12:35:16	0:21:25
31	15-Jul-04	Offshore	5	2		17	14:54:05	15:13:17	0:19:12
32	15-Jul-04	Offshore	4	2		17	16:06:47	16:25:54	0:19:07
33	15-Jul-04	Lunskoye	11,9,7,5	3	Y	18	10:19:11	11:58:04	1:38:53
34	15-Jul-04	Lunskoye	1,3	3	Y	18	15:19:19	16:00:52	0:41:33
35	18-Aug-04	Piltun	1,2	1		19	10:06:51	11:09:58	1:03:07
36	19-Aug-04	Piltun	2	1		20	10:37:58	11:04:33	0:26:35
37	19-Aug-04	Piltun	1	1		20	14:08:05	14:34:54	0:26:49
38	19-Aug-04	Piltun	1	2		21	15:26:52	16:00:36	0:33:44
39	19-Aug-04	Piltun	2	2		21	18:00:36	18:26:09	0:25:33
40	19-Aug-04	Lunskoye	1,3,5,7	3	Y	22	11:36:16	13:44:38	2:08:22
41	19-Aug-04	Lunskoye	9,11	3	Y	22	16:34:33	17:39:28	1:04:55
42	20-Aug-04	Piltun	2	1		23	9:26:49	9:59:44	0:32:55
43	20-Aug-04	Piltun	1	1		23	13:15:23	13:40:15	0:24:52

Case	Date	Type of survey	Lines flown	Survey in day	Full survey	Survey ID	Survey start	Survey end	Duration
44	20-Aug-04	Piltun	4,1,3,2	2	Y	24	14:35:54	16:42:35	2:06:41
45	20-Aug-04	Offshore	9-2	3	Y	25	10:14:06	13:07:24	2:53:18
46	18-Sep-04	Piltun	2	1		26	10:09:02	10:41:17	0:32:15
47	18-Sep-04	Offshore	9-3, 1	2	Y	27	10:55:01	13:44:56	2:49:55
48	18-Sep-04	Piltun	4,2,3,1	3	Y	28	15:30:15	17:42:26	2:12:11
49	19-Sep-04	Piltun	2	1		29	9:36:34	10:08:23	0:31:49
50	19-Sep-04	Piltun	1	1		29	13:27:11	13:57:42	0:30:31
51	19-Sep-04	Offshore	6	2		30	10:20:36	10:41:53	0:21:17
52	19-Sep-04	Offshore	7	2		30	15:35:22	15:57:11	0:21:49
53	19-Sep-04	Offshore	4	2		30	17:11:22	17:30:09	0:18:47
54	19-Sep-04	Lunskoye	1,3,5,7	3	Y	31	10:49:56	13:01:37	2:11:41
55	19-Sep-04	Lunskoye	7,9,11	3	Y	31	16:03:14	17:07:43	1:04:29
56	19-Sep-04	Piltun	1	4		32	14:53:35	15:24:00	0:30:25
57	19-Sep-04	Piltun	2	4		32	17:39:06	18:08:11	0:29:05
58	20-Sep-04	Piltun	2	1		33	9:43:34	10:11:46	0:28:12
59	20-Sep-04	Piltun	1	1		33	13:20:03	13:45:17	0:25:14
60	20-Sep-04	Extensive	1-6	2	Y	34	10:58:19	12:35:28	1:37:09
61	20-Sep-04	Extensive	7-12	2	Y	34	15:41:55	17:22:46	1:40:51
62	20-Sep-04	Offshore	6	3		35	12:48:51	13:08:52	0:20:01
63	20-Sep-04	Piltun	2	4		36	14:44:36	15:09:59	0:25:23
64	20-Sep-04	Piltun	1	4		36	17:44:33	18:14:05	0:29:32
65	21-Sep-04	Piltun	2	1		37	9:30:09	9:56:21	0:26:12
66	21-Sep-04	Piltun	1	1		37	13:11:03	13:29:44	0:18:41
67	21-Sep-04	Extensive	13-22	2	Y	34	10:15:55	13:05:26	2:49:31
68	22-Sep-04	Piltun	2	1		38	11:06:23	11:23:00	0:16:37
69	22-Sep-04	Extensive	23-34	2	Y	34	11:25:15	14:55:48	3:30:33
70	21-Oct-04	Piltun	2	1		39	10:02:00	10:30:26	0:28:26
71	21-Oct-04	Piltun	1	1		39	13:33:55	13:58:21	0:24:26
72	21-Oct-04	Lunskoye	1,3,5,7	2	Y	40	11:02:02	12:58:04	1:56:02
73	21-Oct-04	Lunskoye	9,11	2	Y	40	16:09:59	17:04:15	0:54:16
74	21-Oct-04	Offshore	1	3		41	13:05:55	13:25:14	0:19:19
75	21-Oct-04	Offshore	2	3		41	15:41:08	15:59:23	0:18:15
76	21-Oct-04	Piltun	1	4		42	15:02:32	15:31:35	0:29:03
77	21-Oct-04	Piltun	3,2	4		42	17:08:08	17:56:17	0:48:09
78	26-Oct-04	Piltun	1,2,3,4	1	Y	43	9:51:22	11:43:59	1:52:37
79	28-Oct-04	Piltun	1	1		44	9:41:51	10:06:21	0:24:30
80	28-Oct-04	Piltun	2	1		44	12:00:46	12:22:11	0:21:25
81	28-Oct-04	Offshore	9-6	2		45	10:26:05	11:50:33	1:24:28
82	29-Nov-04	Piltun	2	1		46	12:07:55	12:33:27	0:25:32
83	29-Nov-04	Offshore	9-6	2		47	12:47:27	14:09:59	1:22:32
84	2-Dec-04	Piltun	2	1		48	10:48:48	11:16:39	0:27:51
85	2-Dec-04	Piltun	1	1		48	14:22:33	14:41:49	0:19:16
86	2-Dec-04	Offshore	5	2		49	11:29:23	11:48:05	0:18:42
87	2-Dec-04	Offshore	4	2		49	13:54:25	14:09:29	0:15:04
88	2-Dec-04	Lunskoye	1,3,5,7	3		50	11:54:29	13:49:09	1:54:40

Table 7. Summary of time spent on conducting aerial surveys off the northeast coast of Sakhalin in 2003.

	Month	Extensive	Lunskoye	Offshore	Piltun	Total per month
Total time	June		2:58:15	4:29:51	4:35:42	12:03:48
Total whales seen			0.0	3.0	0.0	3.0
Whales per hr			0.0	0.5	0.0	0.0
Total time	July	6:40:57	2:32:49	3:57:51	6:42:38	19:54:15
Total whales seen		12.0	0.0	14.0	62.0	88.0
Whales per hr		2.0	0.0	2.3	9.4	1.1
Total time	August		3:13:17	2:53:18	6:00:16	12:06:51
Total whales seen			0.0	9.0	89.0	98.0
Whales per hr			0.0	1.5	14.8	1.2
Total time	September	9:38:04	3:16:10	4:11:49	7:36:07	24:42:10
Total whales seen		11.0	0.0	12.0	112.0	135.0
Whales per hr		1.8	0.0	2.0	14.8	1.6
Total time	October		2:50:18	2:02:02	4:48:36	9:40:56
Total whales seen			0.0	0.0	45.0	45.0
Whales per hr			0.0	0.0	9.4	0.5
Total time	Nov/Dec		1:54:40	1:56:18	1:12:39	5:03:37
Total whales seen			0.0	3.0	1.0	4.0
Whales per hr			0.0	0.5	0.9	0.0
Total time	Total per type	16:19:01	16:45:29	19:31:09	30:55:58	83:31:37
Total whales seen		23.0	0.0	41.0	309.0	373.0
Whales per hr		3.8	0.0	6.8	10.0	4.5

Table 8. Number of gray whales observed on-transect in Piltun area in 2003.

Date	Survey_ID	Line 1	Line 2	Line 3	Line 4	Total ON
5-Jun	1					0
6-Jun	2					0
7-Jun	4					0
5-Jul	7		11			11
8-Jul	8	5	3			8
9-Jul	11	2	9			11
9-Jul	12	1				1
10-Jul	13		4			4
15-Jul	15	3	12			15
15-Jul	16	4	8			12
18-Aug	19	6	3			9
19-Aug	20	7	5			12
19-Aug	21	12	7			19
20-Aug	23	17	5			22
20-Aug	24	16	11			27
18-Sep	26	8	5			13
18-Sep	28	6	7	1	2	16
19-Sep	32	13	9			22
19-Sep	29	11	7			18
20-Sep	33	6	5			11
20-Sep	36	11				11
21-Sep	37	10	3			13
22-Sep	38		8			8
21-Oct	39	10	4			14
21-Oct	42	9	1			10
26-Oct	43	3	6	2		11
28-Oct	44	10				10
29-Nov	46					0
2-Dec	48		1			1

Table 9. Number of gray whales observed on-transect in Offshore area in 2003.

Date	Line 3	Line 5	Line 6	Line 7	Line 9	Total
6-Jun		1	1			2
7-Jun		1				1
8-Jul			8			8
15-Jul		1	4	1		6
20-Aug	1	6	2			9
18-Sep		2	3			5
19-Sep			6			6
20-Sep			1			1
21-Oct						0
28-Oct						0
29-Nov				1	2	3
2-Dec						0
Total	1	11	25	2	2	41

Table 10. Locations of sighted whales other than gray whales, 2003.

Date	Survey Type	Aircraft	Altitude, m ASL	on or off	Time	Species	Whales	Offset, m	Latitude	Longitude
7 June	Lunskoye	An-28	500	on	10:58:20	Minke	1	857	52.870580	143.354969
8 July	Offshore	AN-28	500	off	9:52:46	Minke	1	1500	52.89113	143.34567
8 July	Offshore	AN-28	500	on	9:53:45	Minke	1	600	52.93554	143.34719
8 July	Offshore	AN-28	500	on	10:06:17	Minke	1	1000	52.98487	143.33084
8 July	Offshore	AN-28	500	off	10:24:49	Unknown	1	455	52.04991	143.59455
8 July	Offshore	AN-28	500	on	12:03:22	Minke	1	1000	53.20484	143.28264
8 July	Offshore	AN-28	500	on	12:27:15	Minke	1	750	53.18501	143.29306
8 July	Extensive	AN-28	500	on	14:54:00	Beaked whale	2	909	51.99856	143.61479
9 July	Extensive	AN-28	500	on	11:29:53	Minke	2	1000	53.11804	143.30157
15 July	Offshore	AN-28	500	on	10:17:33	Minke	2	857	53.07179	143.31558
15 July	Lunskoye	AN-28	500	on	11:55:39	Orca	1	375	53.49268	143.15800
19 August	Lunskoye	AN-28	500	on	11:57:20	Minke	1	1200	53.00465	143.32506
19 August	Lunskoye	AN-28	500	off	13:14:15	Minke	3	2500	52.06435	143.60471
19 August	Lunskoye	AN-28	500	on	13:26:40	Orca	3	714	51.91299	143.61250
20 August	Piltun	AN-28	300	on	15:45:12	Minke	2	5000	52.04172	143.56897
20 August	Piltun	AN-28	300	off	15:52:09	Unknown	1	1000	52.06733	143.61566
20 August	Piltun	AN-28	300	on	16:21:29	Minke	1	455	51.87575	143.59023
18 September	Piltun	AN-28	300	off	15:46:04	Minke	1	909	51.998560	143.614787
18 September	Piltun	AN-28	300	off	17:30:17	Orca	3	0	51.914847	143.553908
19 September	Lunskoye	AN-28	500	on	12:32:35	Orca	3	1667	51.914847	143.578211
19 September	Lunskoye	AN-28	500	off	17:02:42	Orca	3	833	51.962328	143.567231
21 October	Piltun	An-28	300	off	15:01:59	Unknown	1	1000	52.067326	143.615660
28 October	Piltun	An-28	300	0ff	12:22:30	Orca	4	1500	52.720143	143.358402

FIGURES

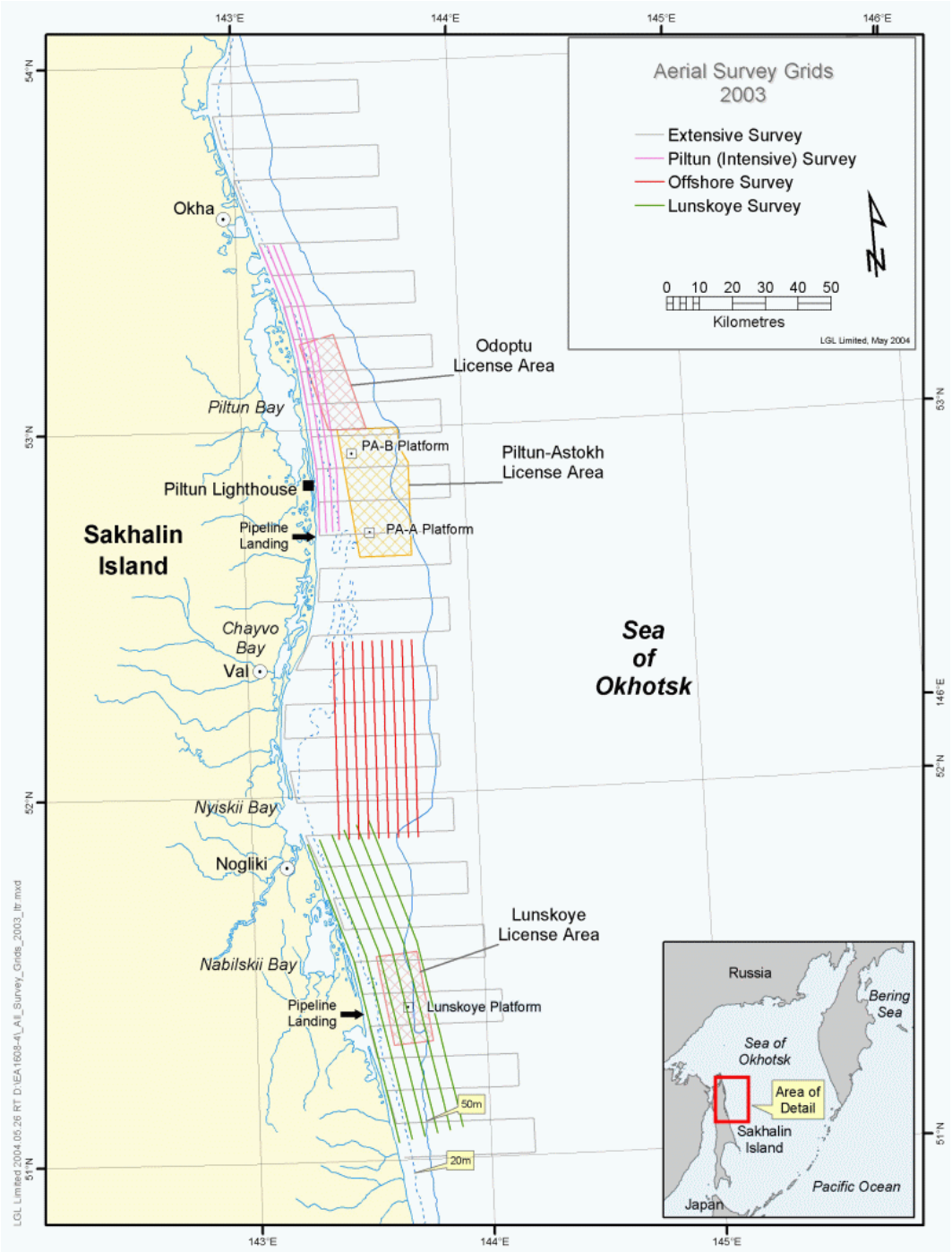


Figure 1. Aerial survey grids used for marine mammal aerial surveys off the NE coast of Sakhalin Island in June – December 2003.

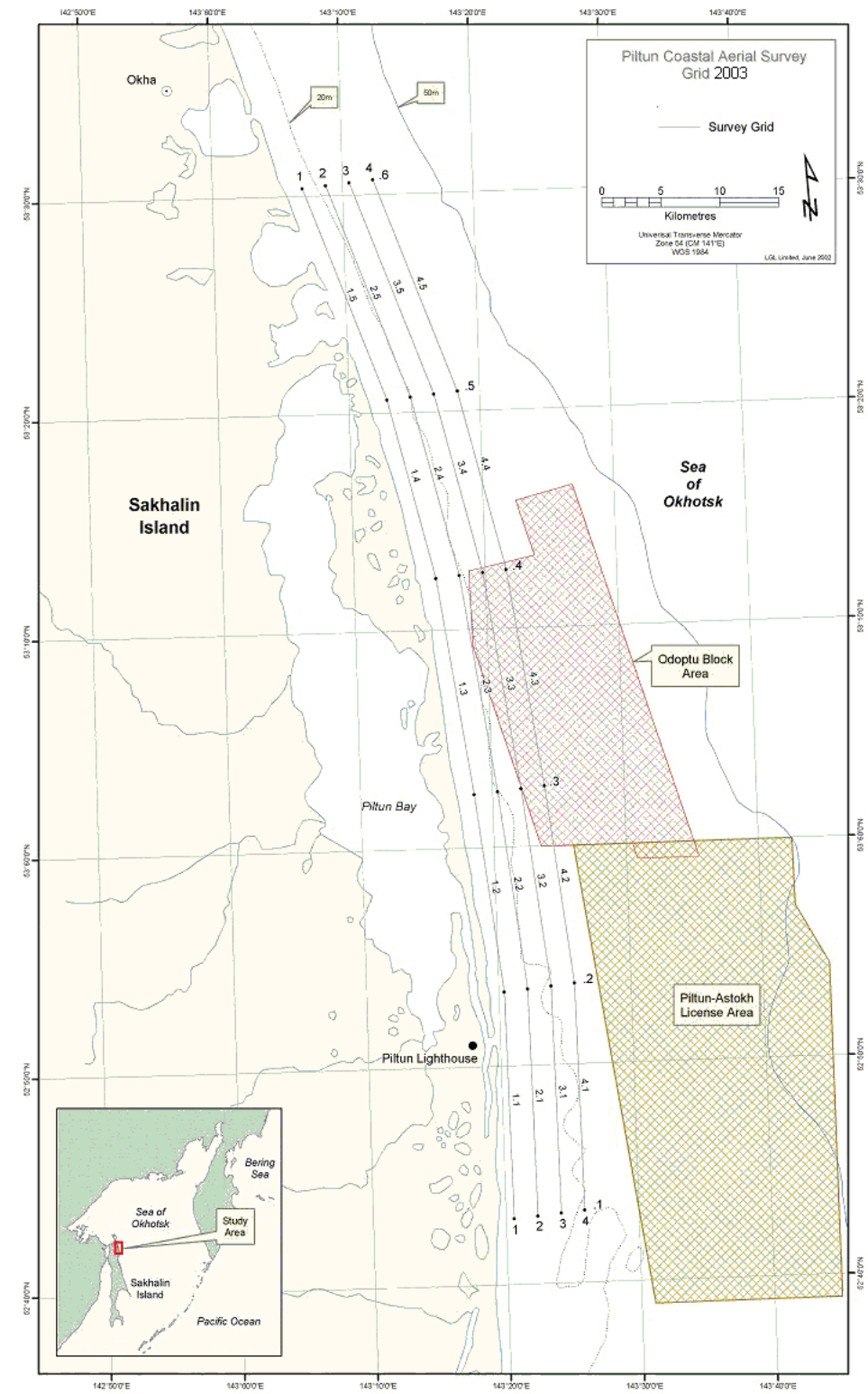


Figure 2. Piltun Bay feeding area survey grid.

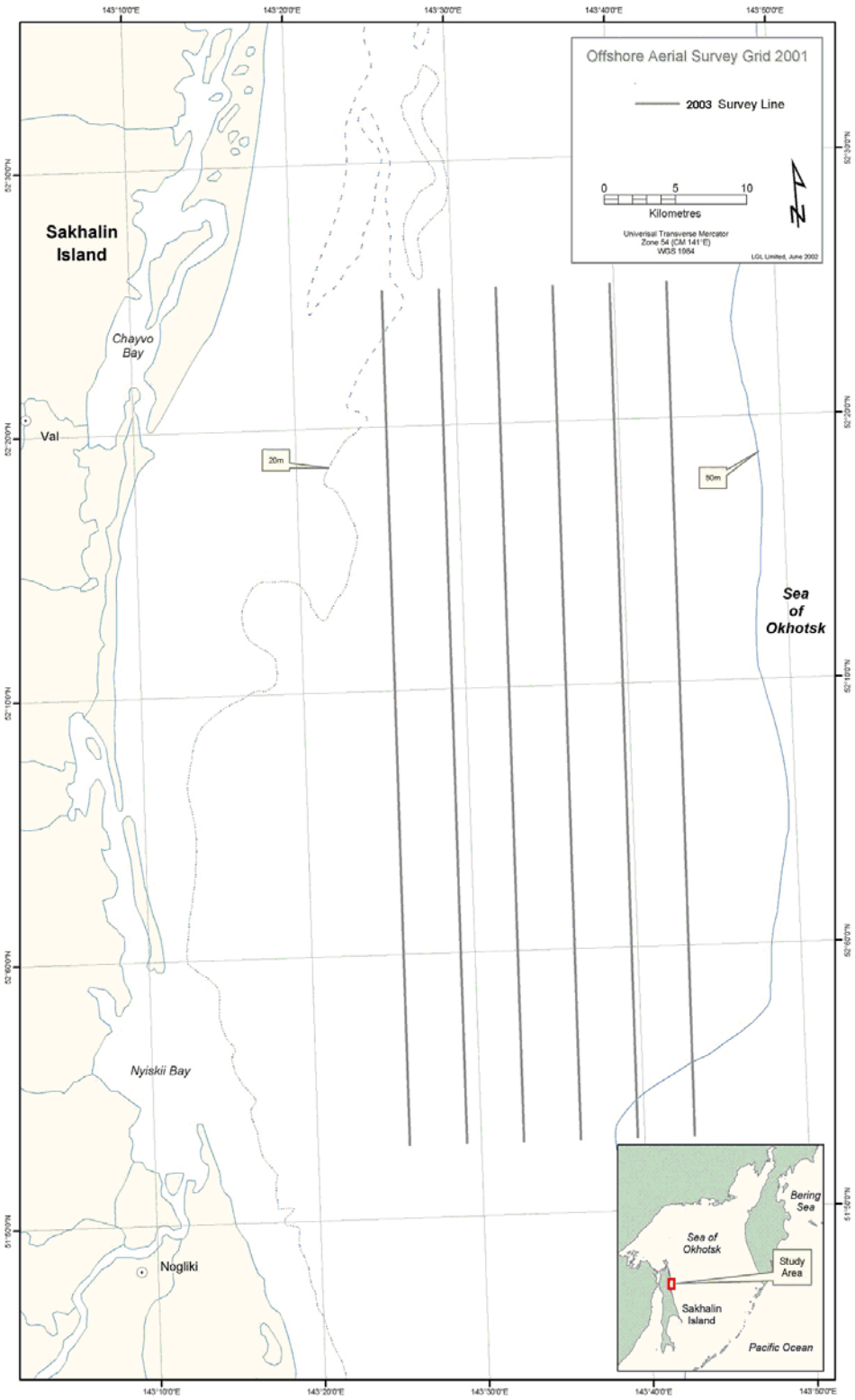


Figure 3. Offshore feeding area survey grid.

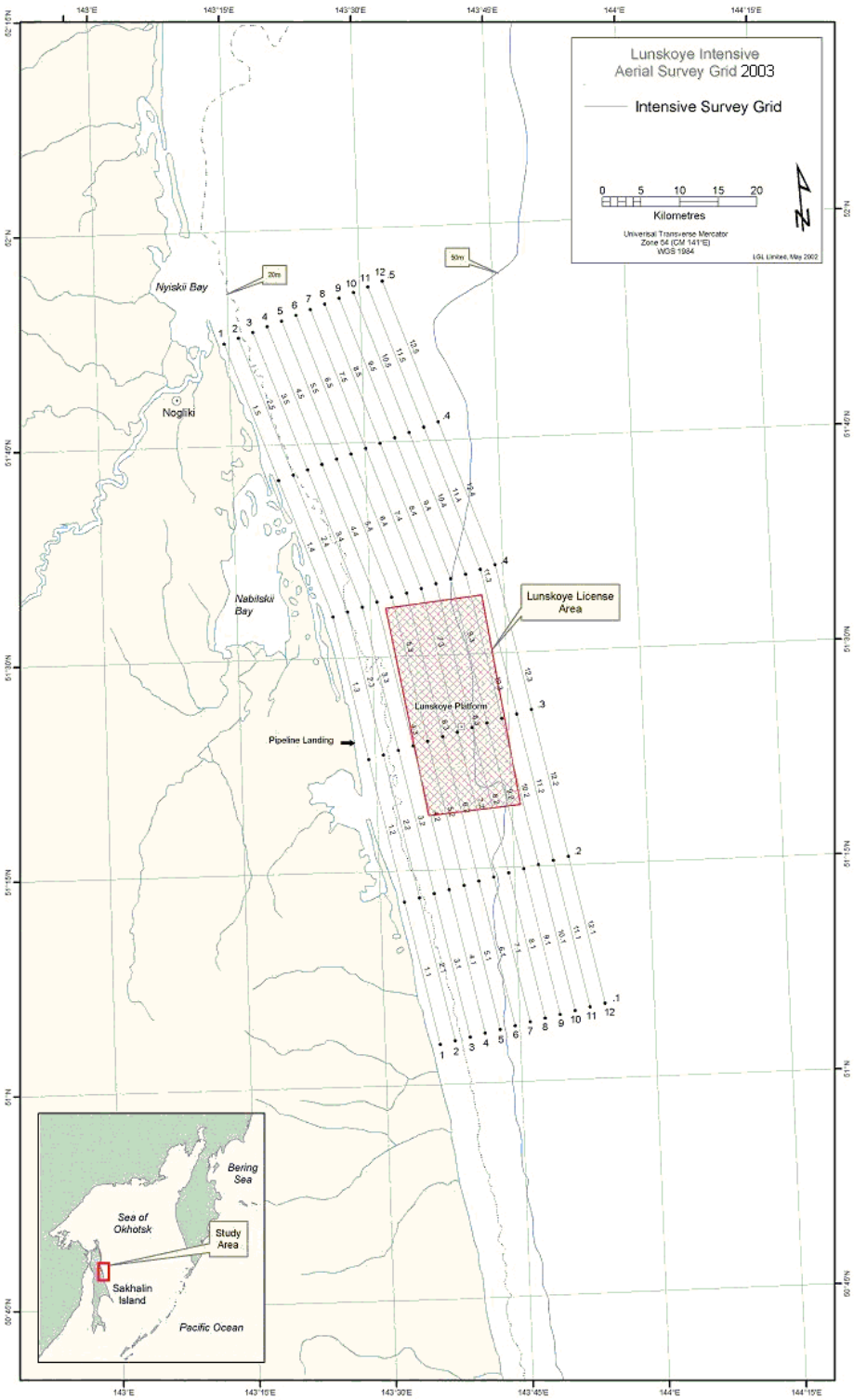


Figure 4. Lunskoye area survey grid.

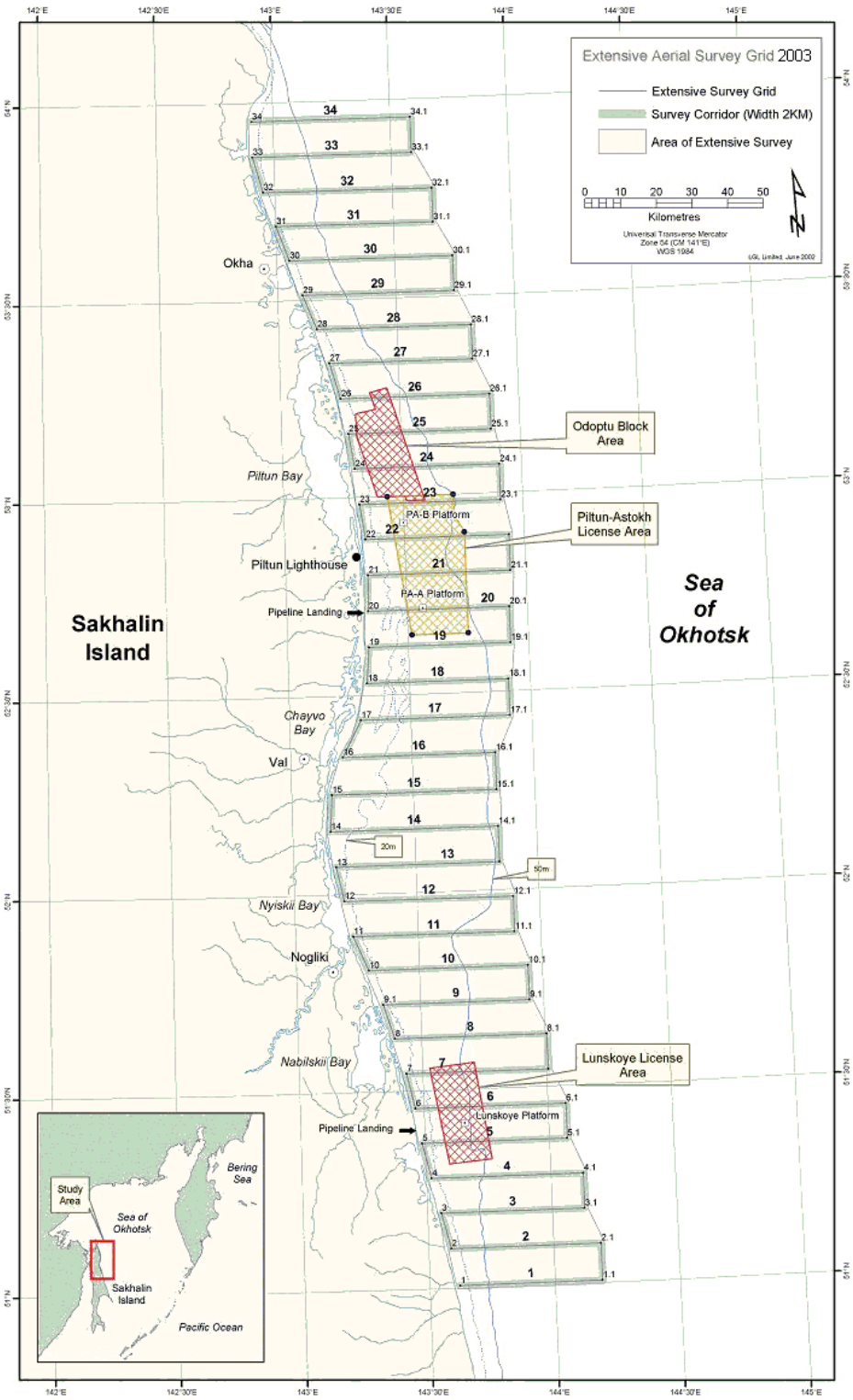


Figure 5. Extensive survey grid.

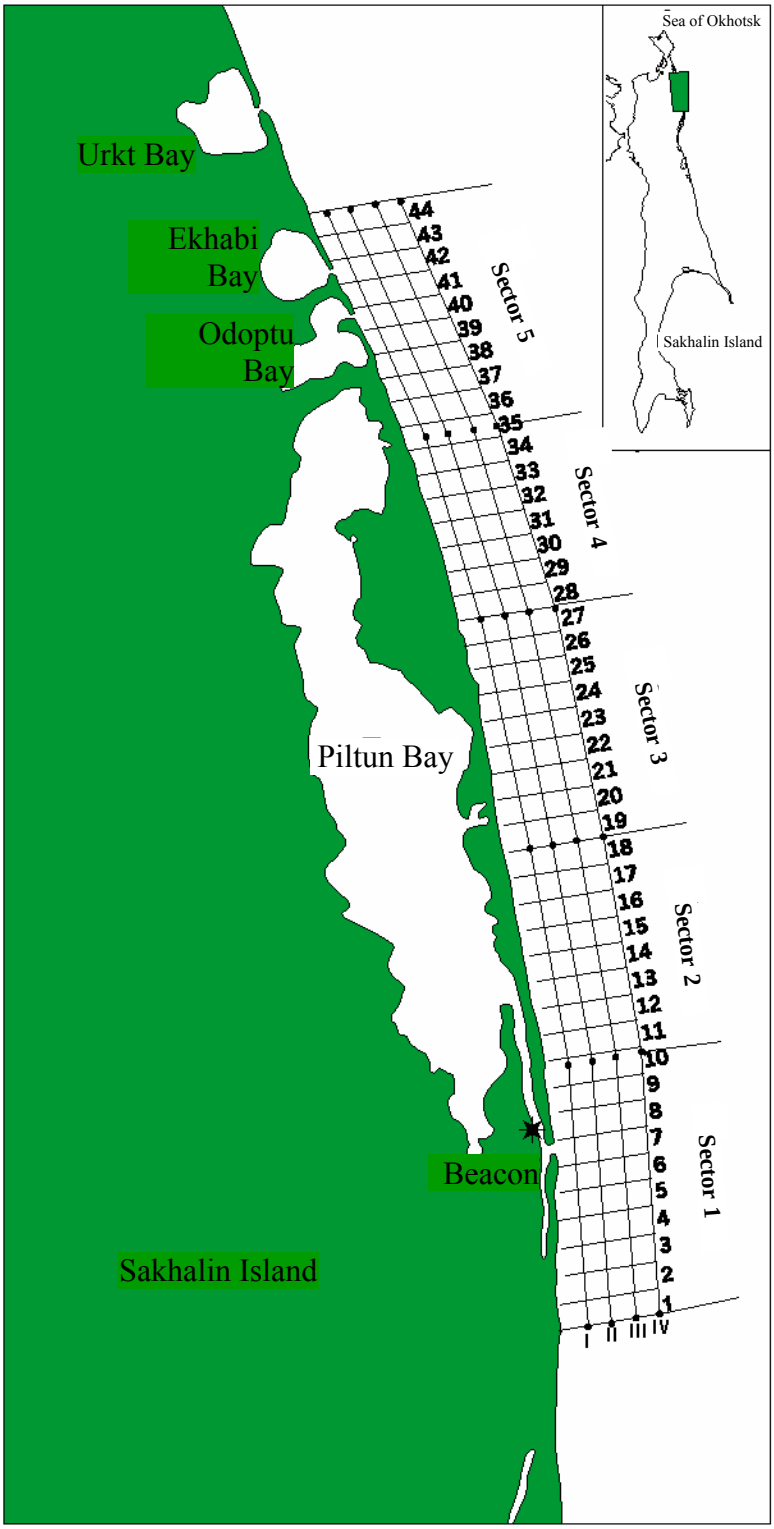


Figure 6. Map of Piltun Area (Figure 1) sectors: 1-44 -- mini-sectors; I-IV. – survey transect lines.

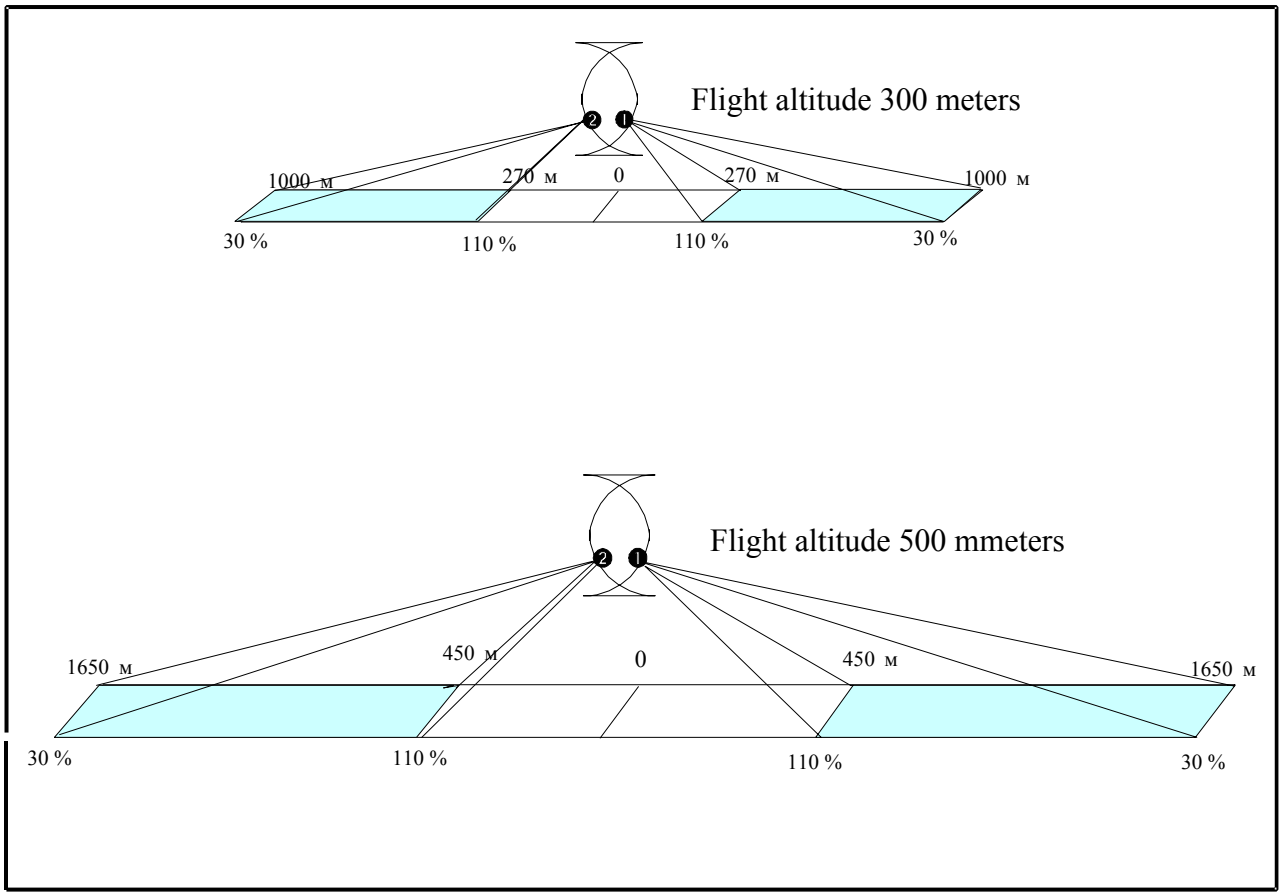


Figure 7. Diagram of water view sectors of two observers in aerial surveys off the NE coast of Sakhalin (An-28) (% - inclinometer readings).

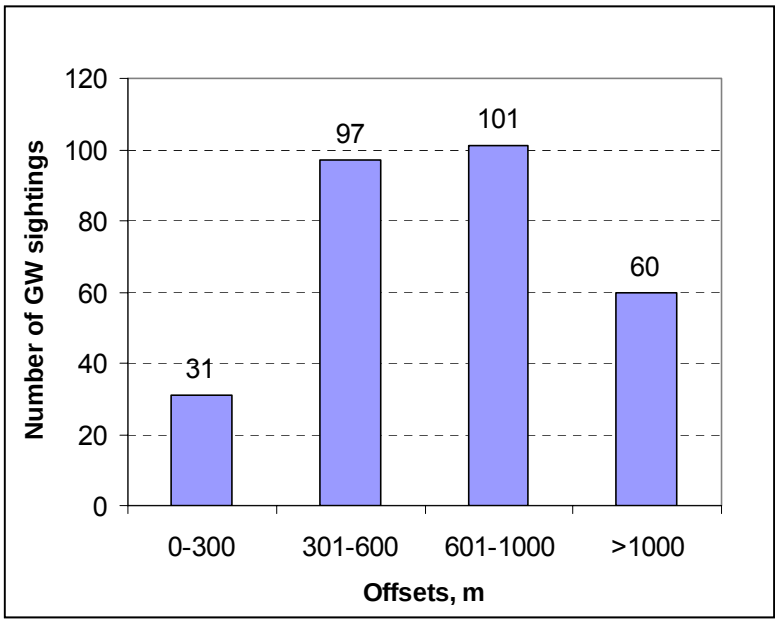


Figure 8. Distances from survey centerline (offsets) at which gray whales were sighted from the aircraft during aerial surveys of the Piltun Area in July-October 2003 (An-28, flight altitude 300 meters, all sightings, unassociated mud plumes excluded).

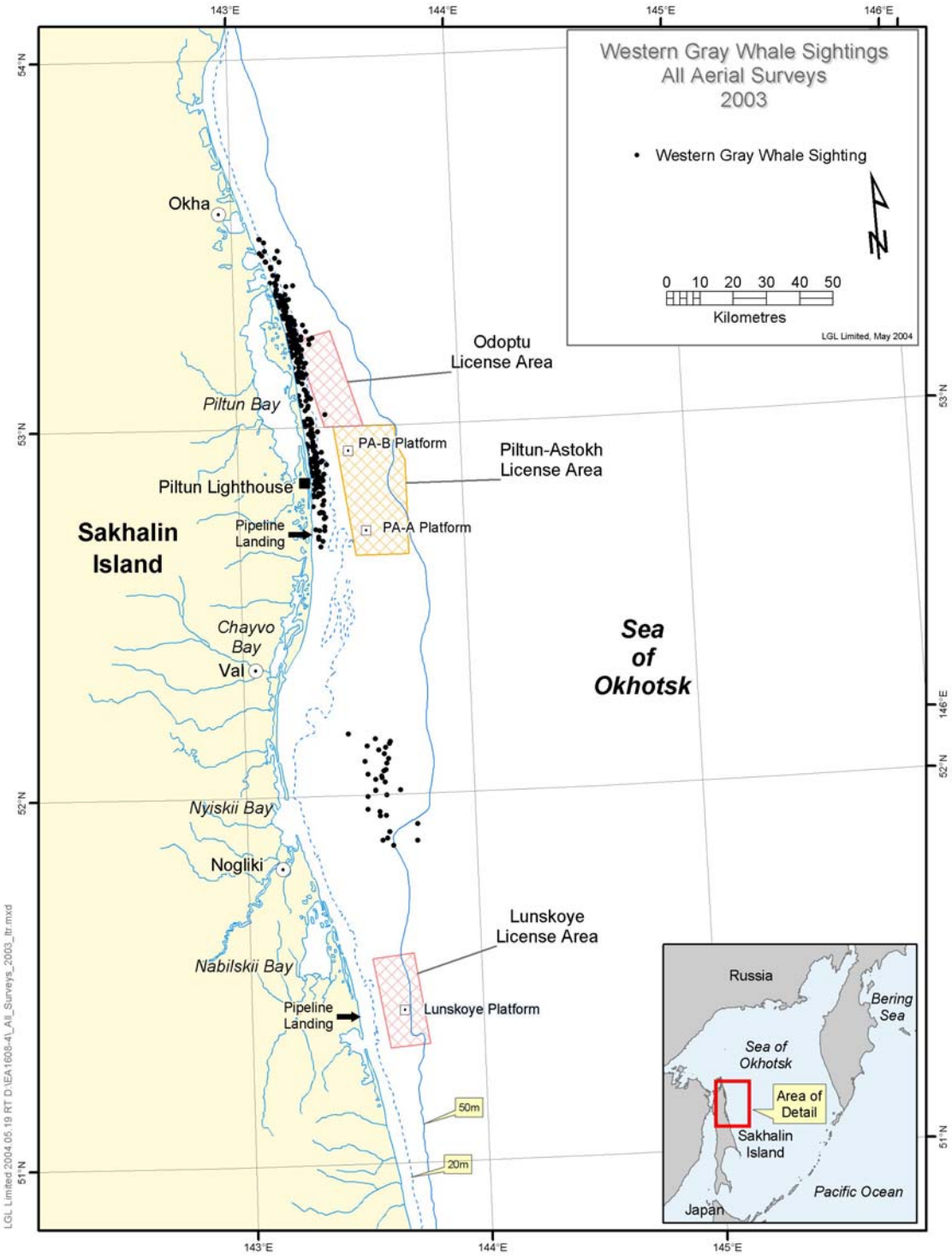


Figure 9. All sightings of gray whales in June-December 2003 over all survey grids.

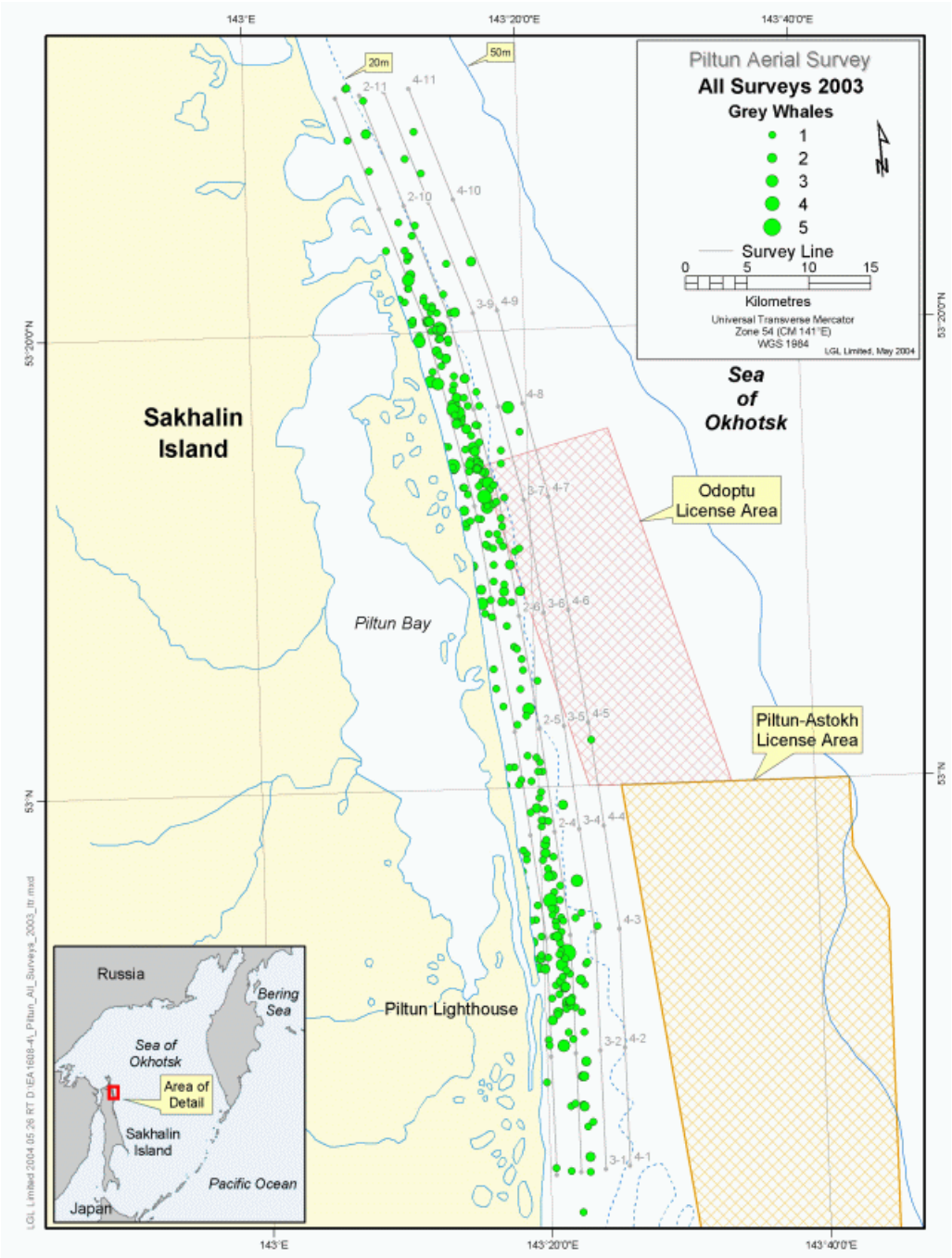


Figure 10. Gray whale sightings in the Piltun area, all aerial surveys combined (June – December 2003, aircraft An-28, all sightings on and off transect, altitude 300 m ASL).

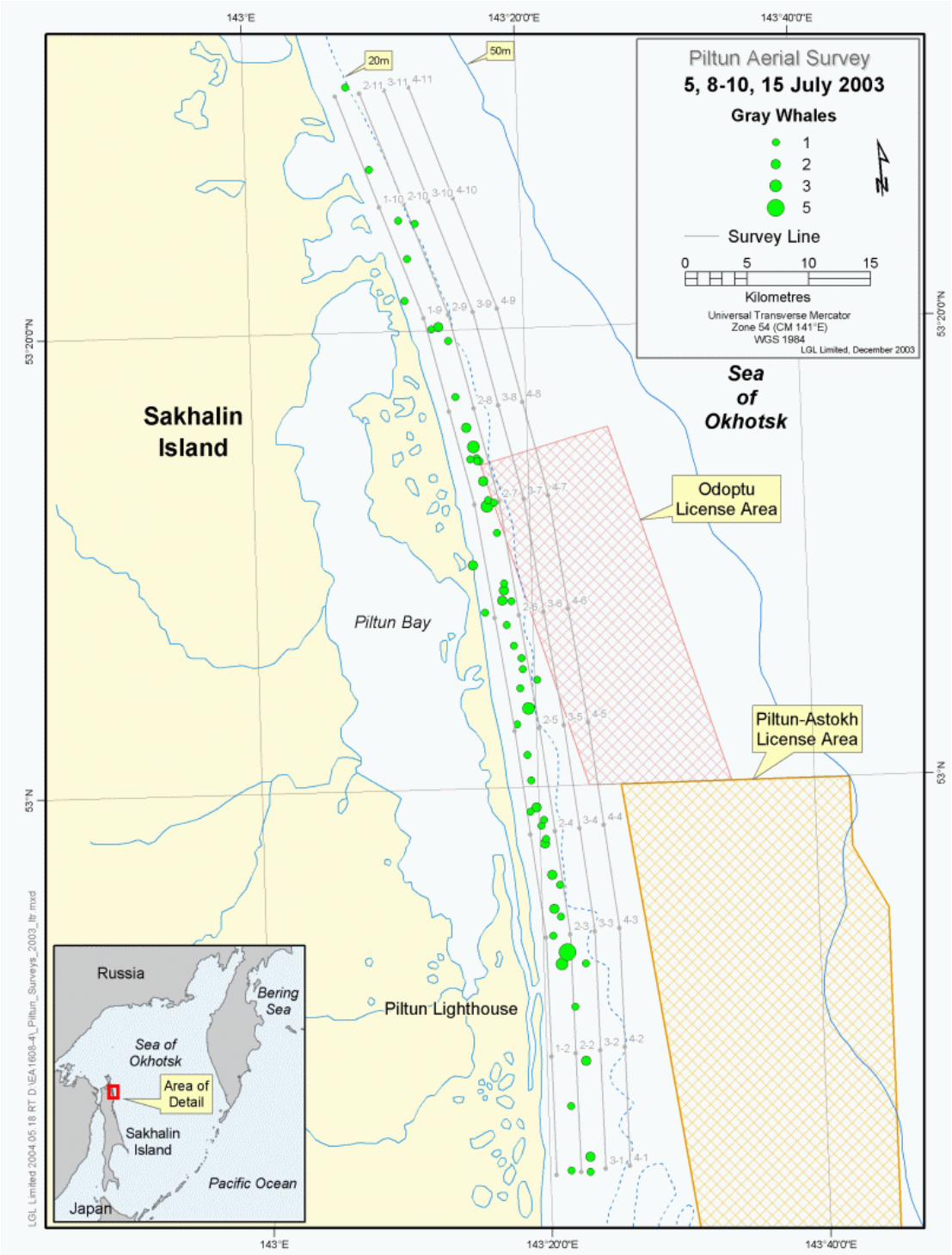


Figure 11. Gray whale sightings in the Piltun area, aerial surveys (July 2003, aircraft An-28, all sightings on and off transect, altitude 300 m ASL).

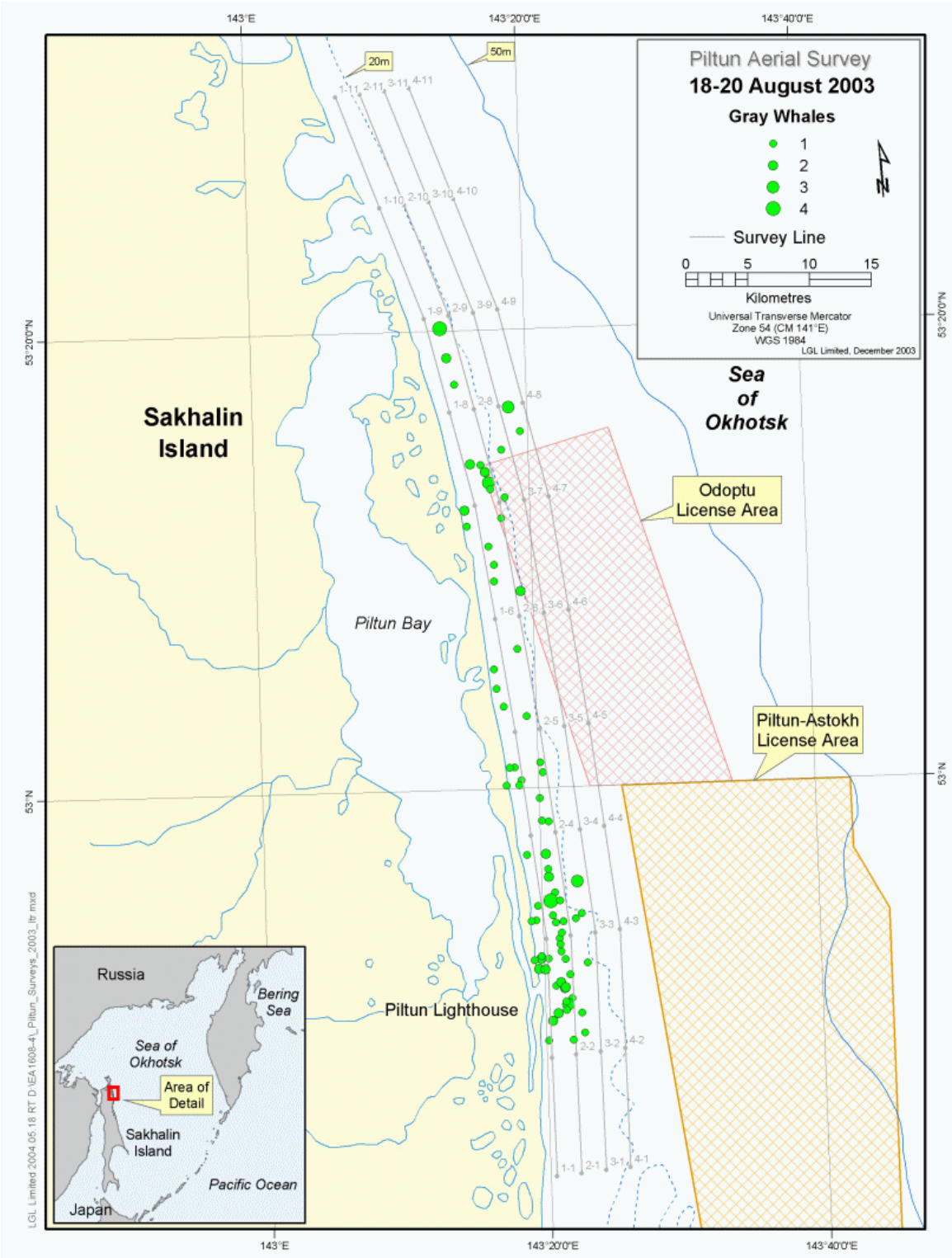


Figure 12. Gray whale sightings in the Piltun area, aerial surveys (August 2003, aircraft An-28, all sightings on and off transect, altitude 300 m ASL).

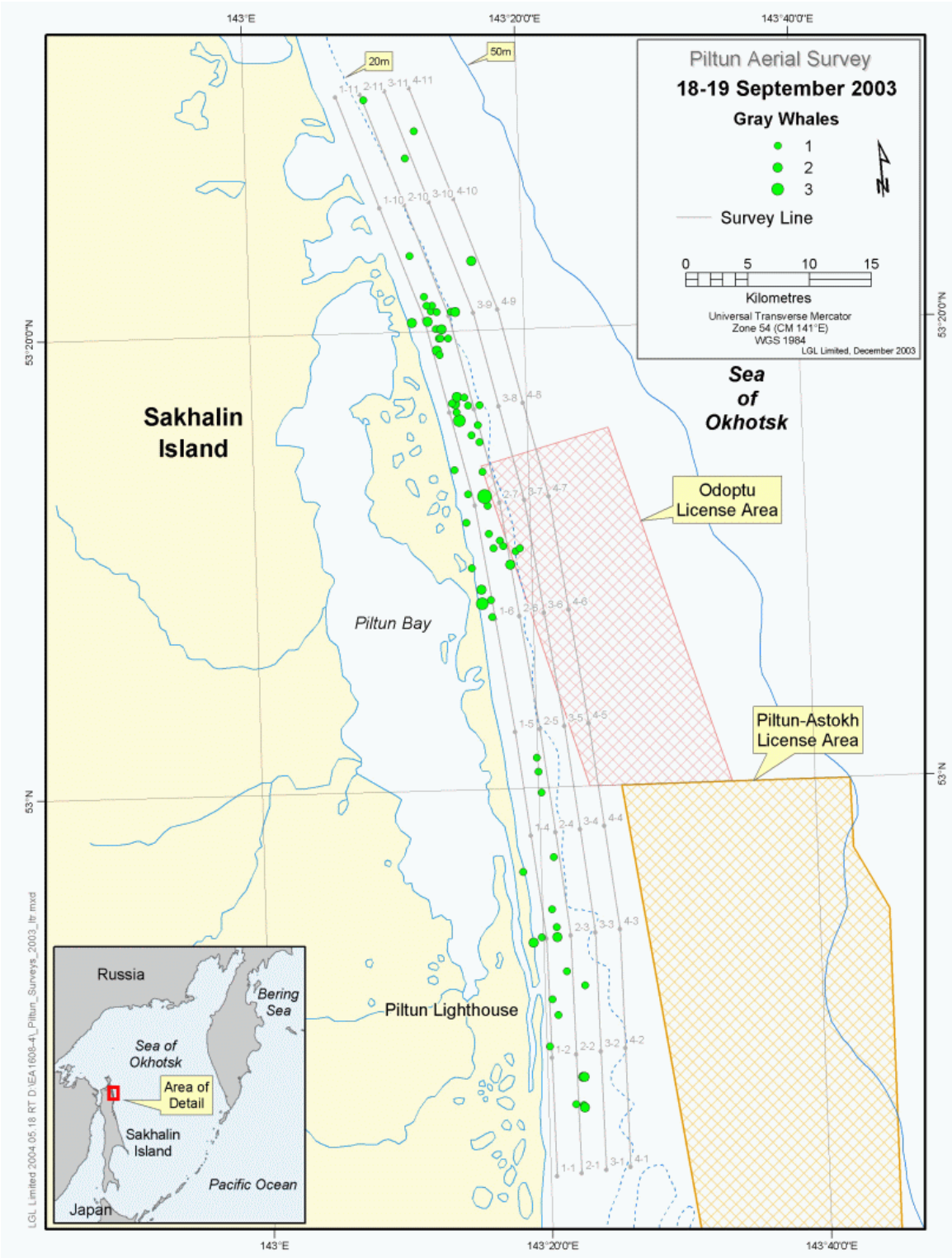


Figure 13. Gray whale sightings in the Piltun area, aerial surveys (September 2003, aircraft An-28, all sightings on and off transect, altitude 300 m ASL).

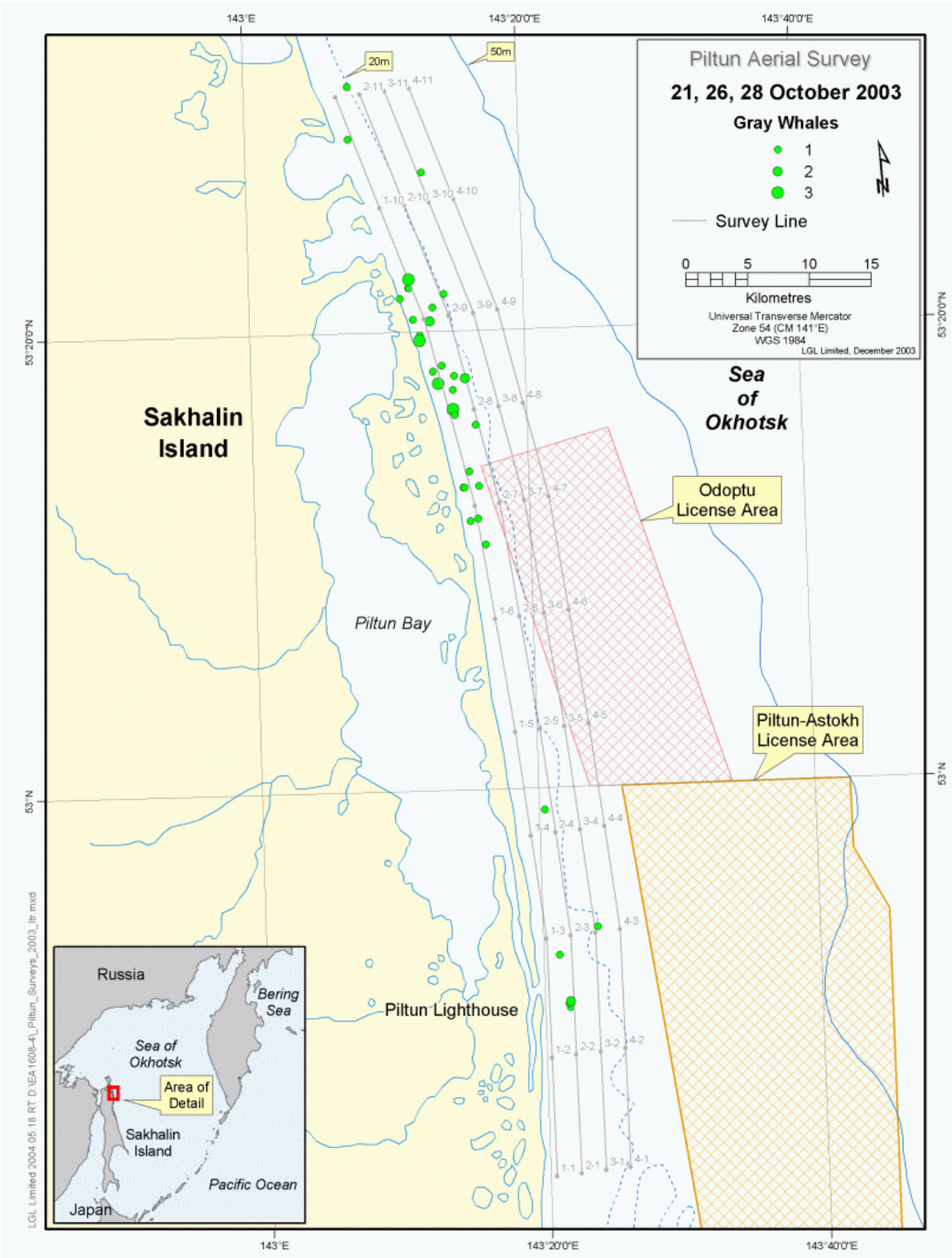


Figure 14. Gray whale sightings in the Piltun area, aerial surveys (October 2003, aircraft An-28, all sightings on and off transect, altitude 300 m ASL).

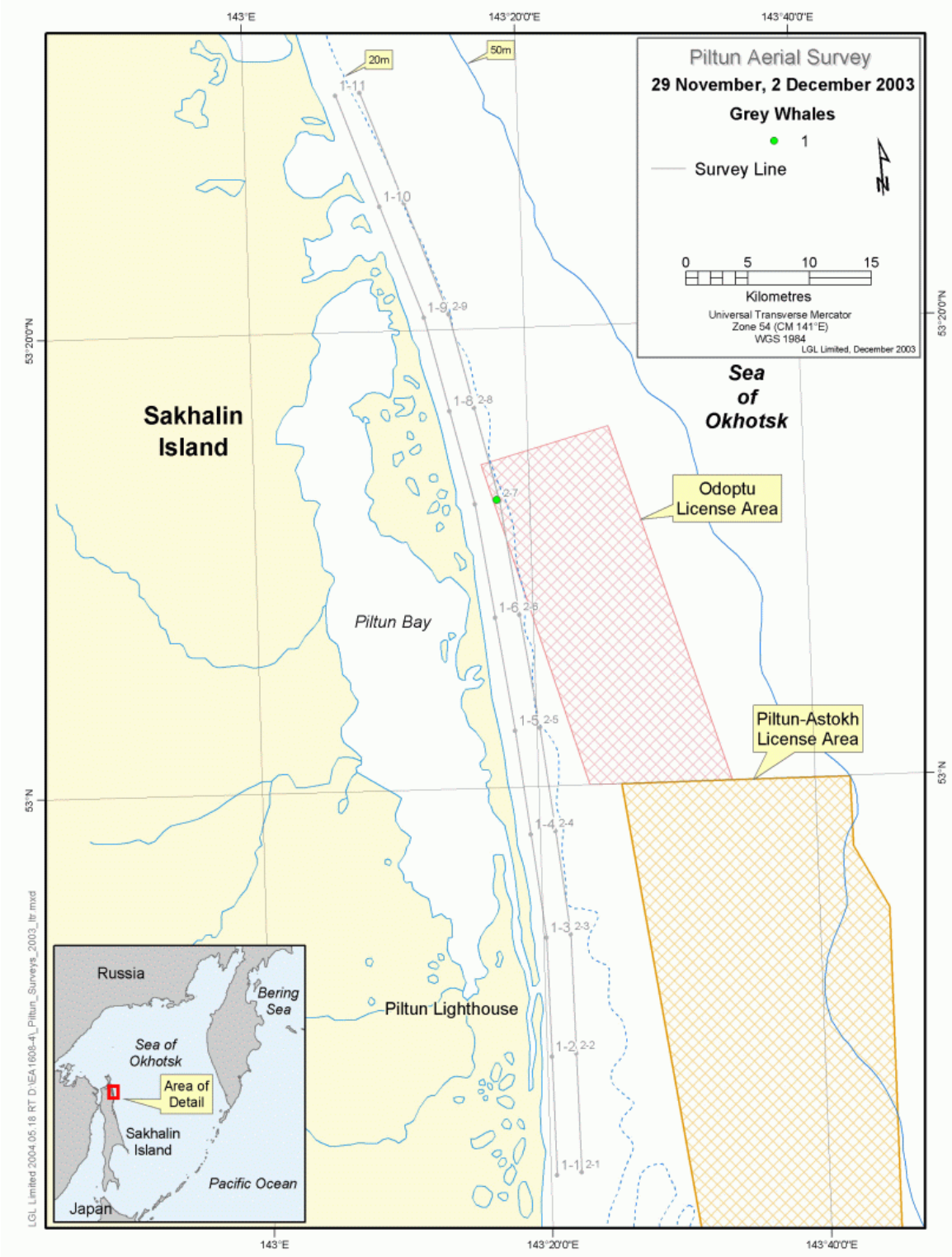


Figure 15. Gray whale sightings in the Piltun area, aerial surveys (29 November and 2 December 2003, aircraft An-28, all sightings on and off transect, altitude 300 m ASL).

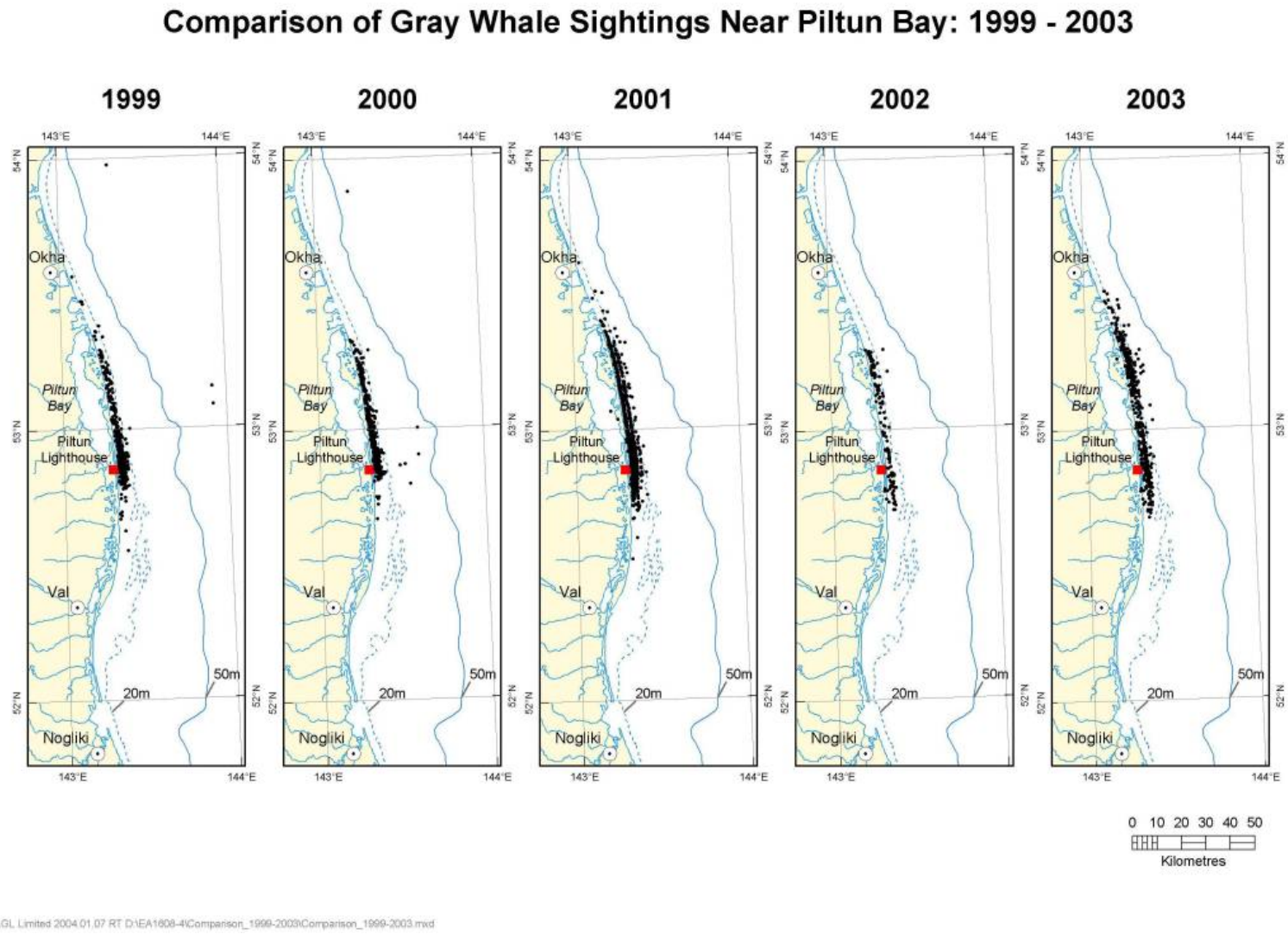


Figure 16. Comparison of gray whale aerial survey sightings (all sightings, on and off transect) in and around Piltun feeding area in 1999-2003. Data for 1999-2002 from Sobolevsky (2000, 2001), Yazvenko *et al*. 2002, Blokhin *et al*. 2003. Survey techniques in 1999-2000 differed from later years.

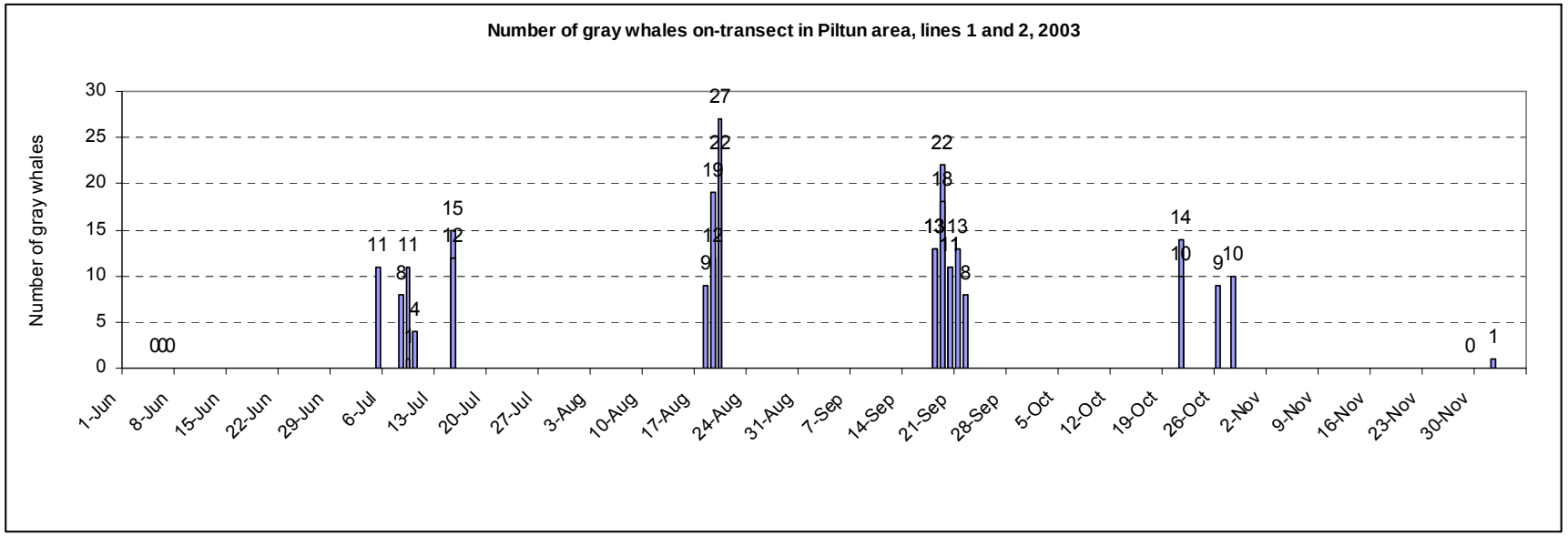
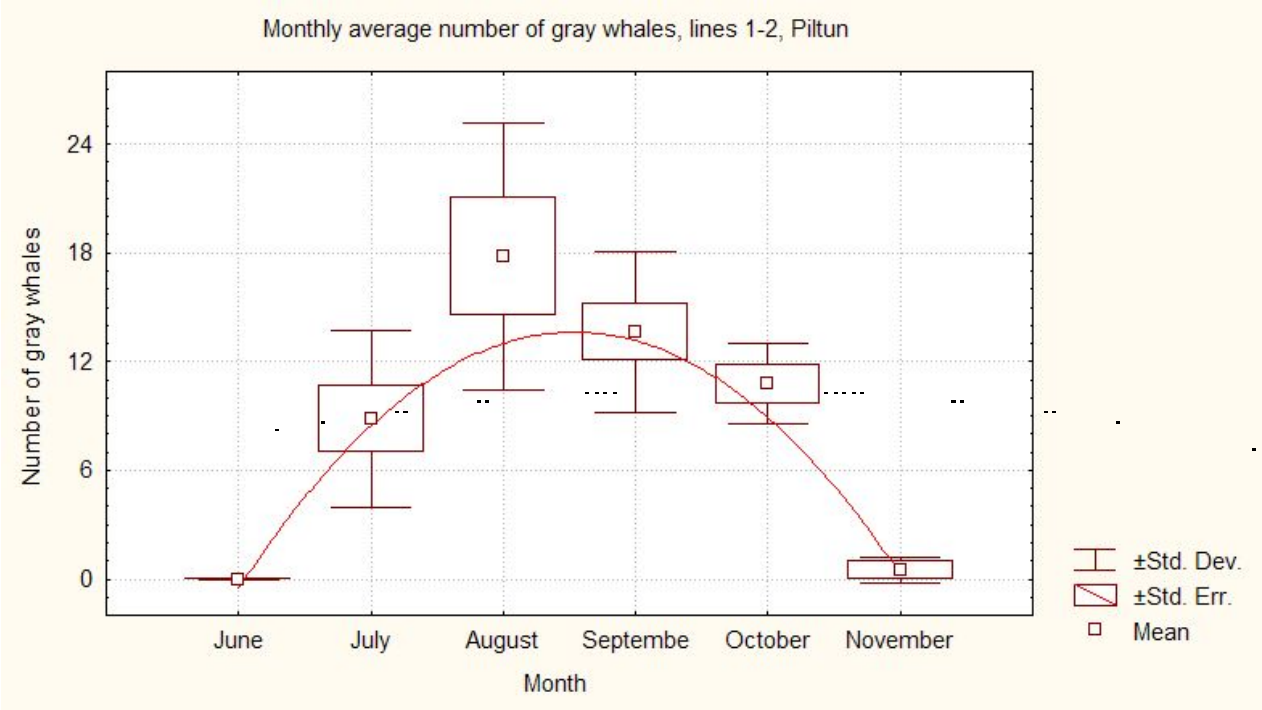


Figure 17. Gray whale aerial observation survey data - Piltun Area (on-transect, lines 1 and 2) in 2003.



Unequal N HSD: Monthly average numbers of gray whales in Piltun, 2003

Marked differences are significant at p < .05000

	June {1}	July {2}	August {3}	September {4}	October {5}	November {6}
	M=0.0000	M=8.8571	M=17.800	M=13.625	M=10.750	M=.50000
June {1}		0.231817769	**0.001540311**	**0.018819077**	0.093594138	0.999997928
July {2}	0.231817769		0.061379961	0.429173723	0.992175399	0.498917651
August {3}	0.001540311	0.061379961		0.724643666	0.312345096	**0.013999531**
September {4}	0.018819077	0.429173723	0.724643666		0.95126308	0.095226485
October {5}	0.093594138	0.992175399	0.312345096	0.95126308		0.284886506
November {6}	0.999997928	0.498917651	**0.013999531**	0.095226485	0.284886506	

Figure 18. Monthly means of gray whale numbers in July-October 2003 (all Intensive surveys, transects 1 and 2, on-transect sightings).

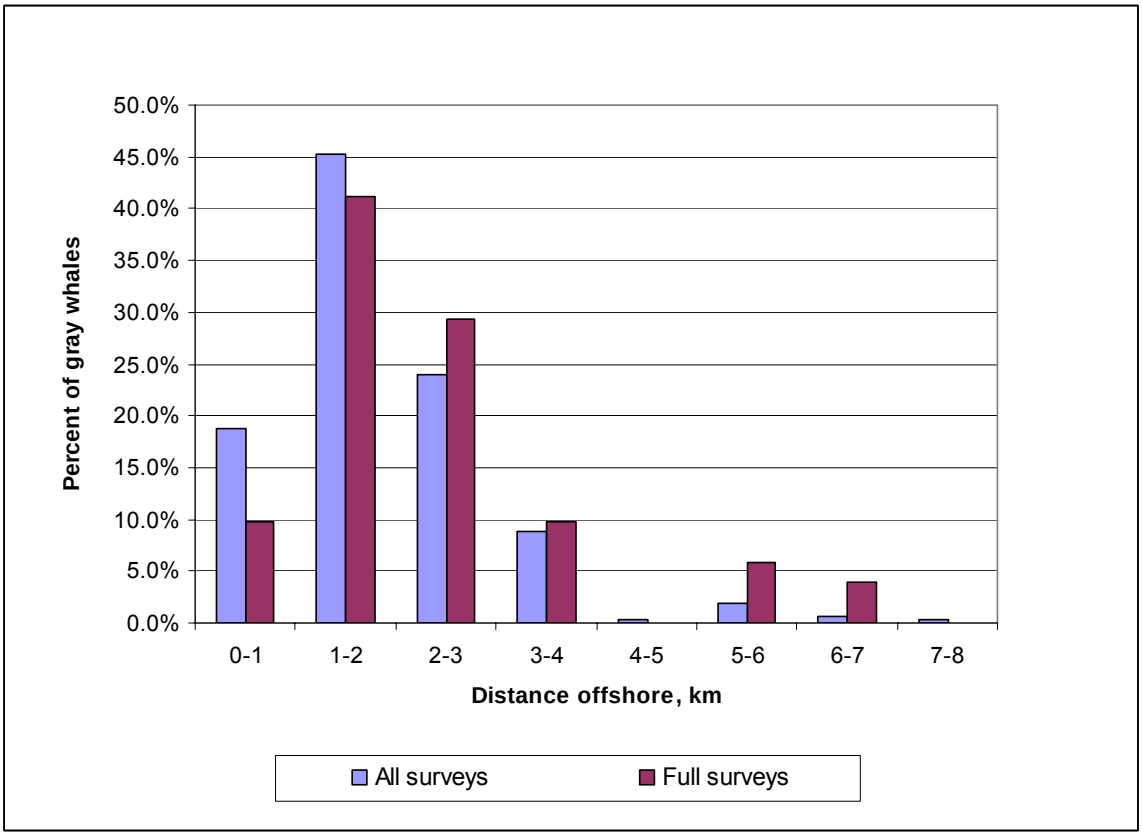
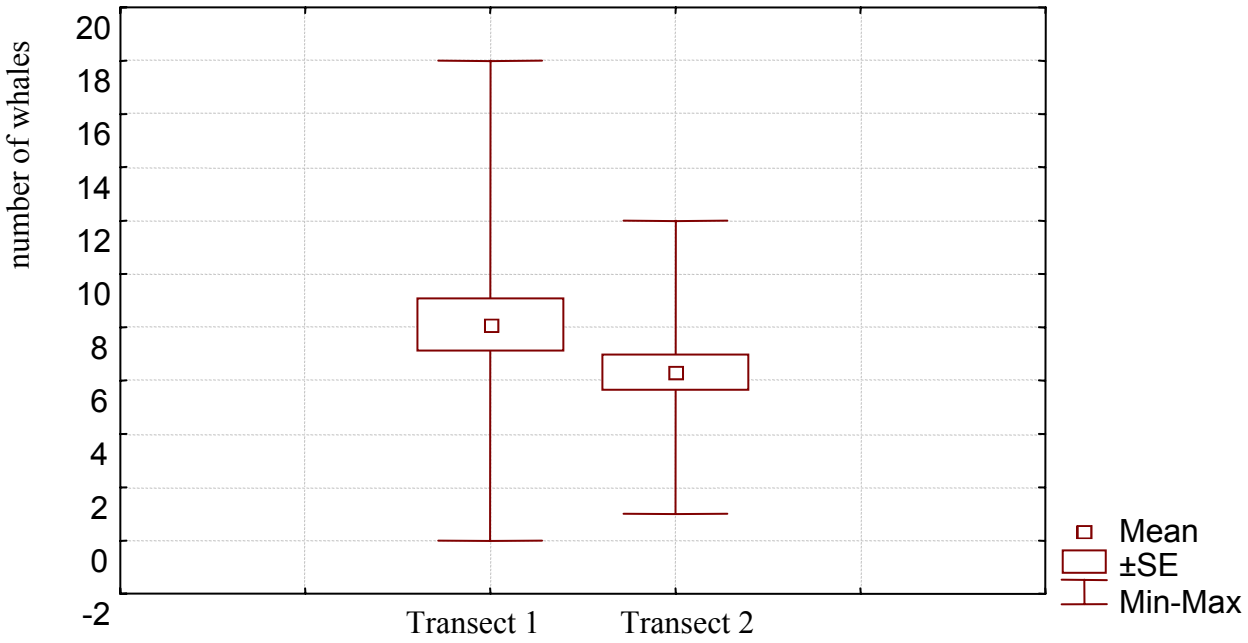


Figure 19. Frequency of gray whale sightings at different distances from the shore - Piltun Area in July-October 2003 (clinometer reading 30-110%, all surveys, including partial surveys, vs. full surveys only).



Group 1 vs. Group 2	T-test						
	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2
Transect vs. Transect 2	8,10	6,32	1,44	37	0,16	20	19

Figure 20. The number of gray whales observed on an individual survey - Transects 1 and 2 (Piltun Area, July-October 2003, An-28, clinometer reading 30-110%, all surveys, including partial surveys)

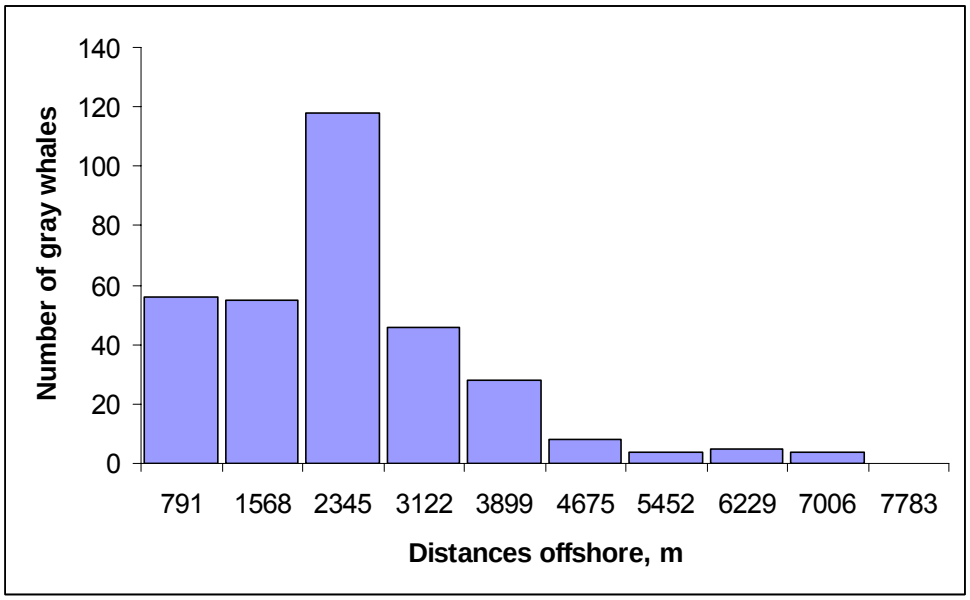
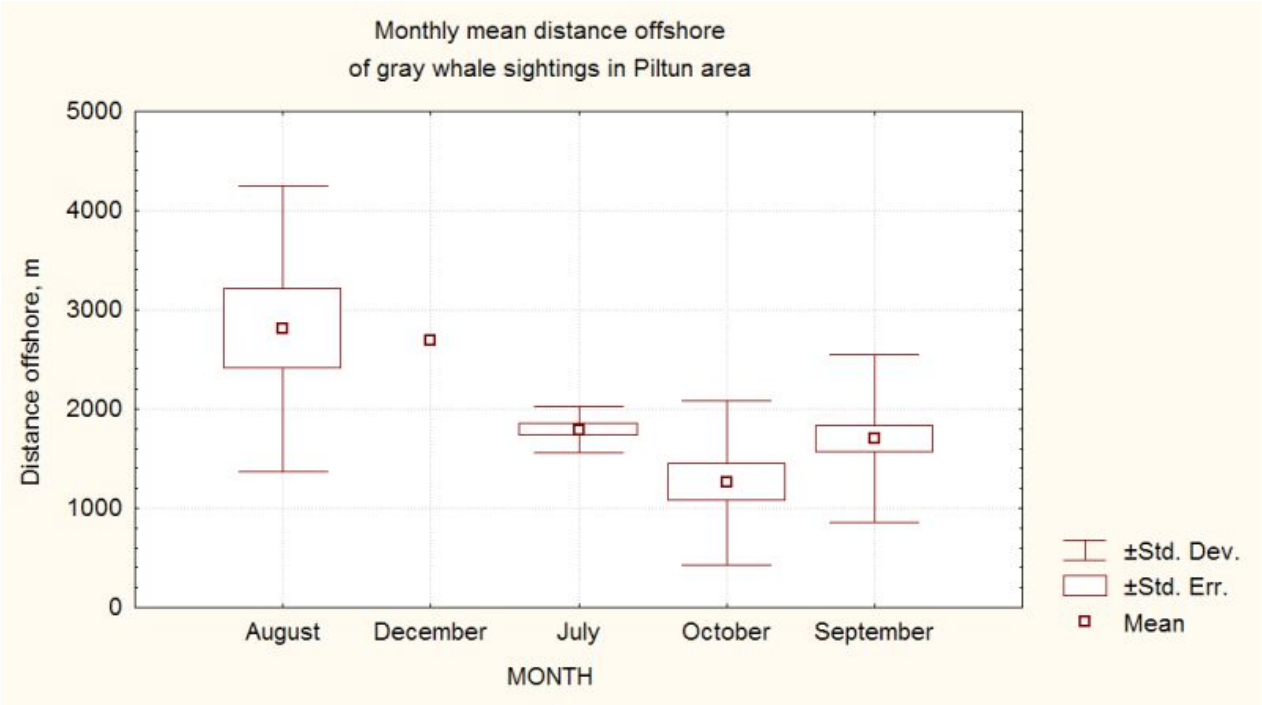


Figure 21. Distances offshore of sightings of gray whales in Piltun area (on- and off-transect sightings).



Unequal N HSD; Variable: DISTANCE (block4.sta)					
Marked differences are significant at p < .05000					
	August {1}	December {2}	July {3}	October {4}	September {5}
	M=2810.8	M=2693.0	M=1789.5	M=1257.9	M=1698.8
August {1}		0.999985	0.054478	**0.000457**	**0.02042**
December {2}	0.999985		0.955018	0.796352	0.937166
July {3}	0.054478	0.955018		0.607023	0.999249
October {4}	**0.000457**	0.796352	0.607023		0.566911
September {5}	**0.02042**	0.937166	0.999249	0.566911	

Figure 22. Monthly dynamics of mean distances offshore in block 4 (northern part of Piltun area). All sightings.

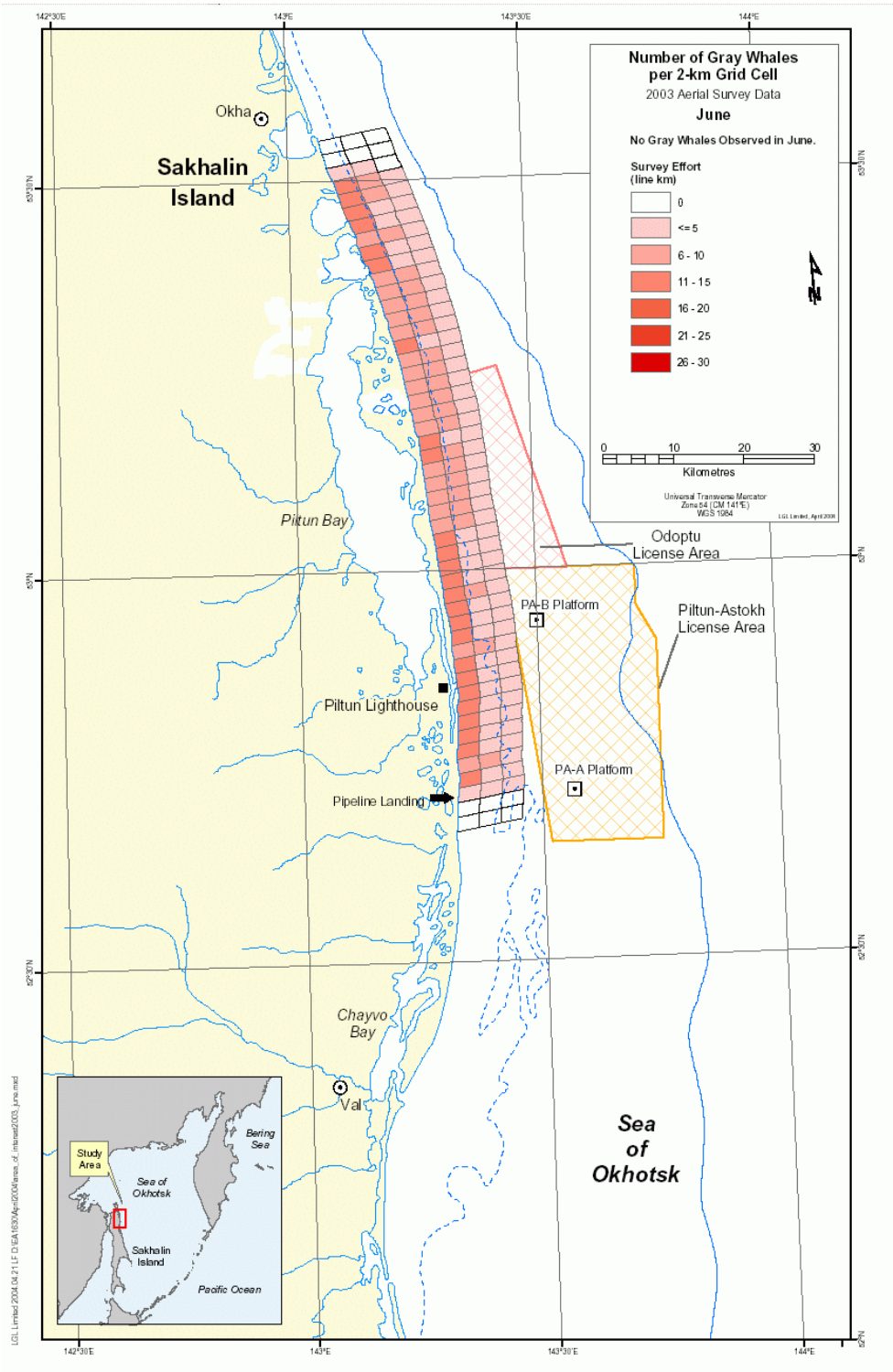


Figure 23. Survey effort (kilometers traveled through each 2x3 km grid cell) in June 2003. Number of gray whales sighted within a cell is shown in the cell (on transect sightings only, all Intensive and Extensive surveys, including partial ones).

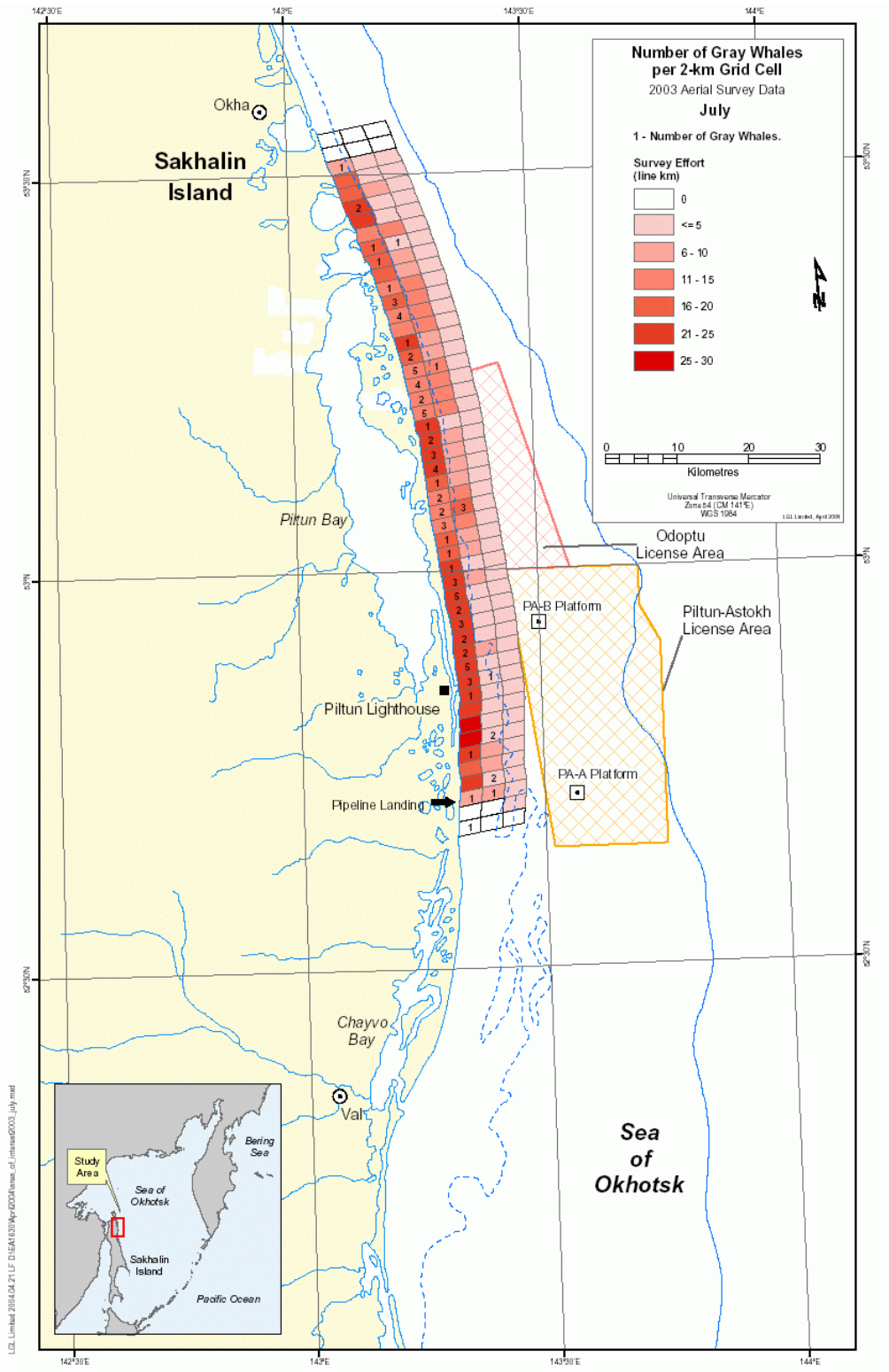


Figure 24. Survey effort (kilometers traveled through each 2x3 km grid cell), July 2003. Number of gray whales sighted within a cell is shown in the cell (on transect sightings only, all Intensive and Extensive surveys, including partial ones).

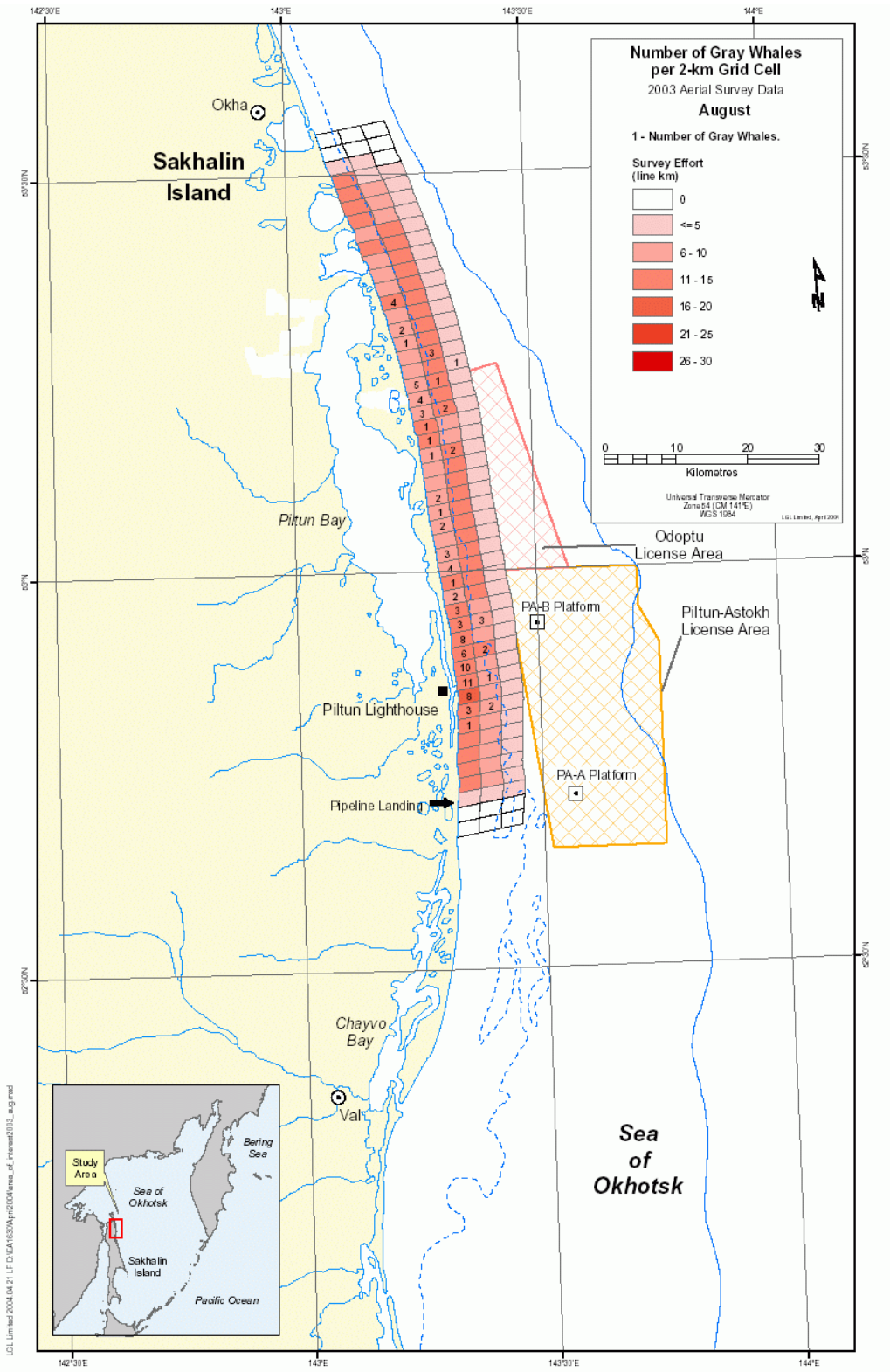


Figure 25. Survey effort (kilometers traveled through each 2x3 km grid cell), August 2003. Number of gray whales sighted within a cell is shown in the cell (on transect sightings only, all Intensive and Extensive surveys, including partial ones).

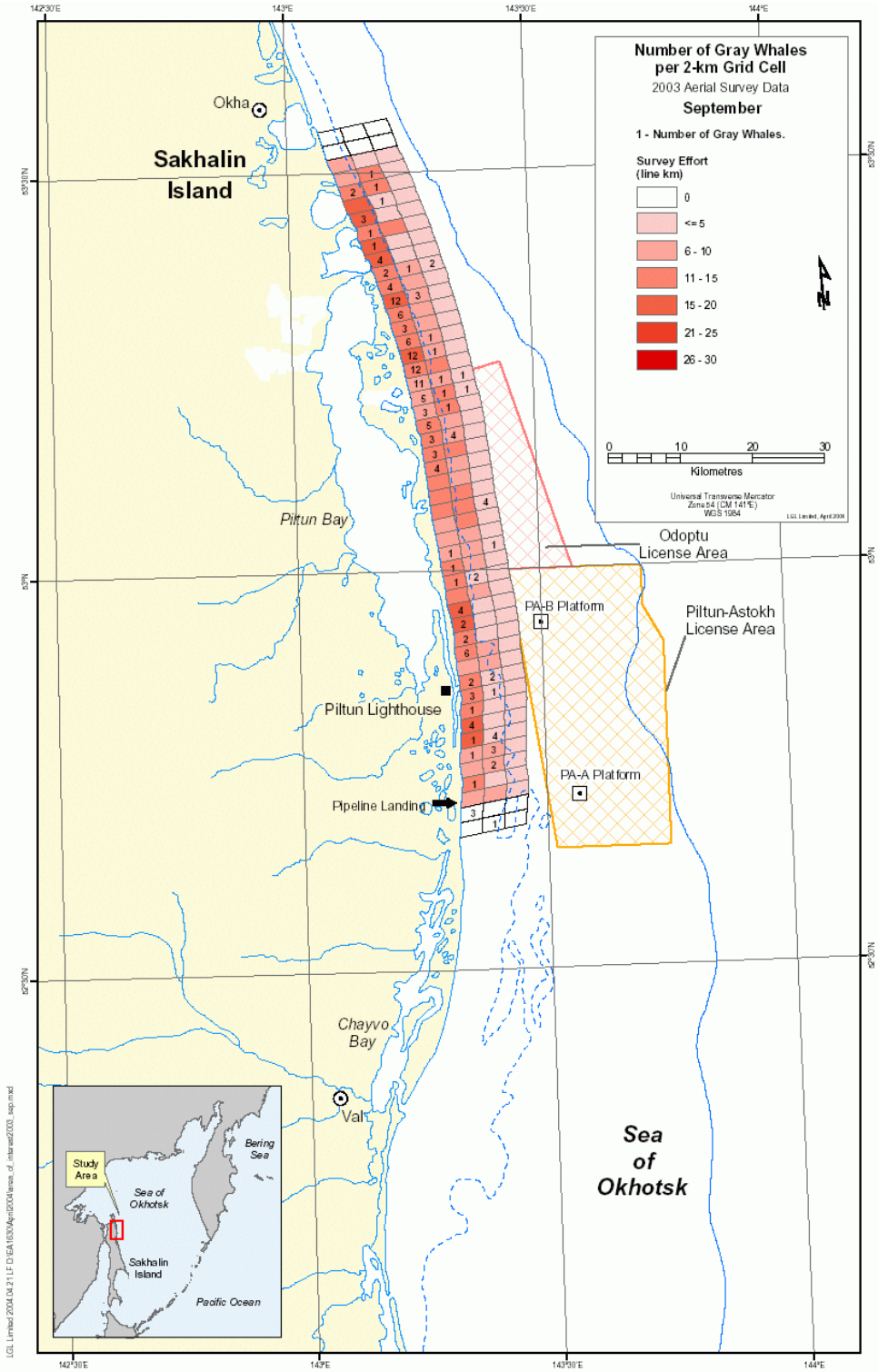


Figure 26. Survey effort (kilometers traveled through each 2x3 km grid cell), September 2003. Number of gray whales sighted within a cell is shown in the cell (on transect sightings only, all Intensive and Extensive surveys, including partial ones).

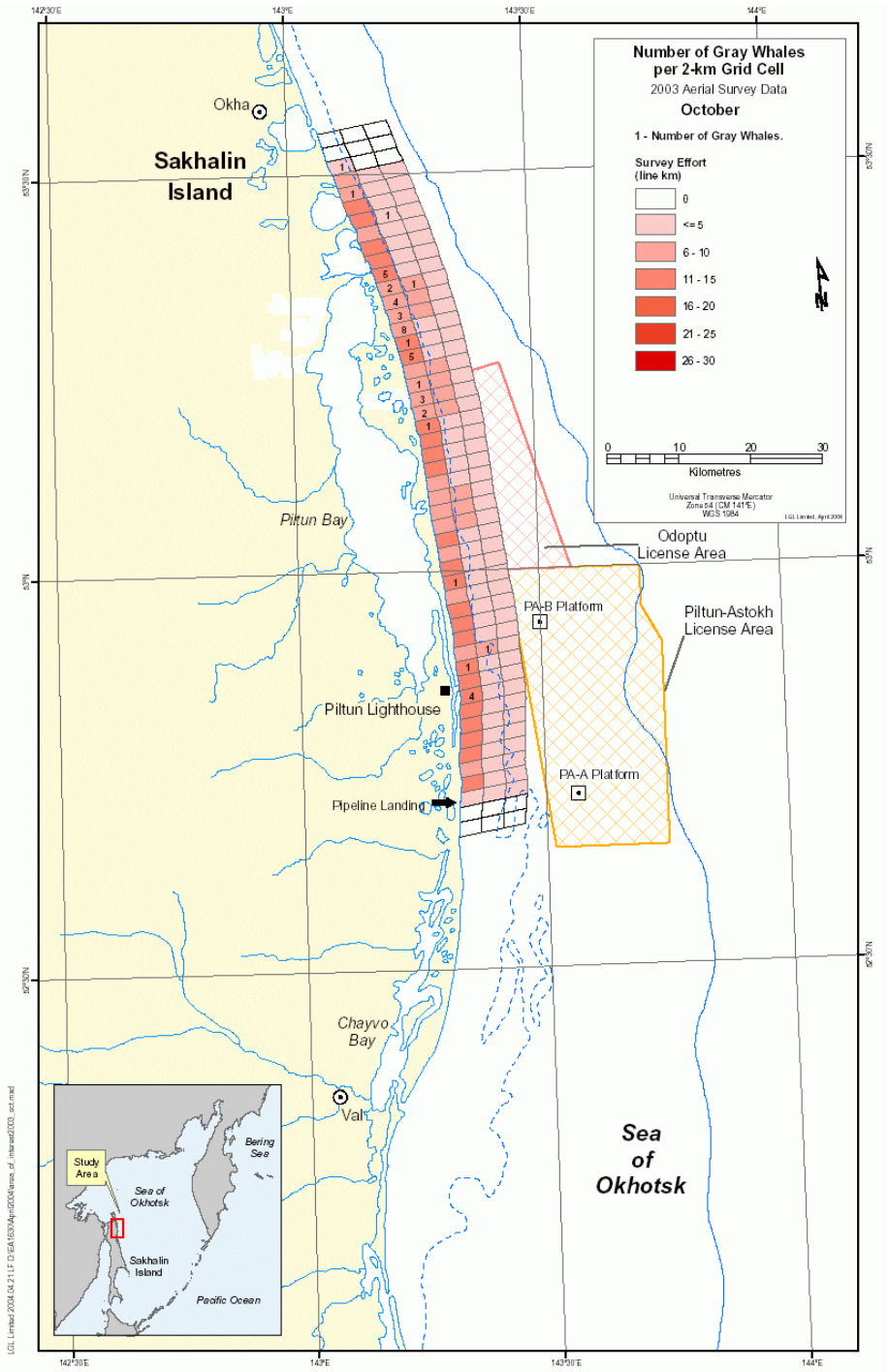


Figure 27. Survey effort (kilometers traveled through each 2x3 km grid cell), October 2003. Number of gray whales sighted within a cell is shown in the cell (on transect sightings only, all Intensive and Extensive surveys, including partial ones).

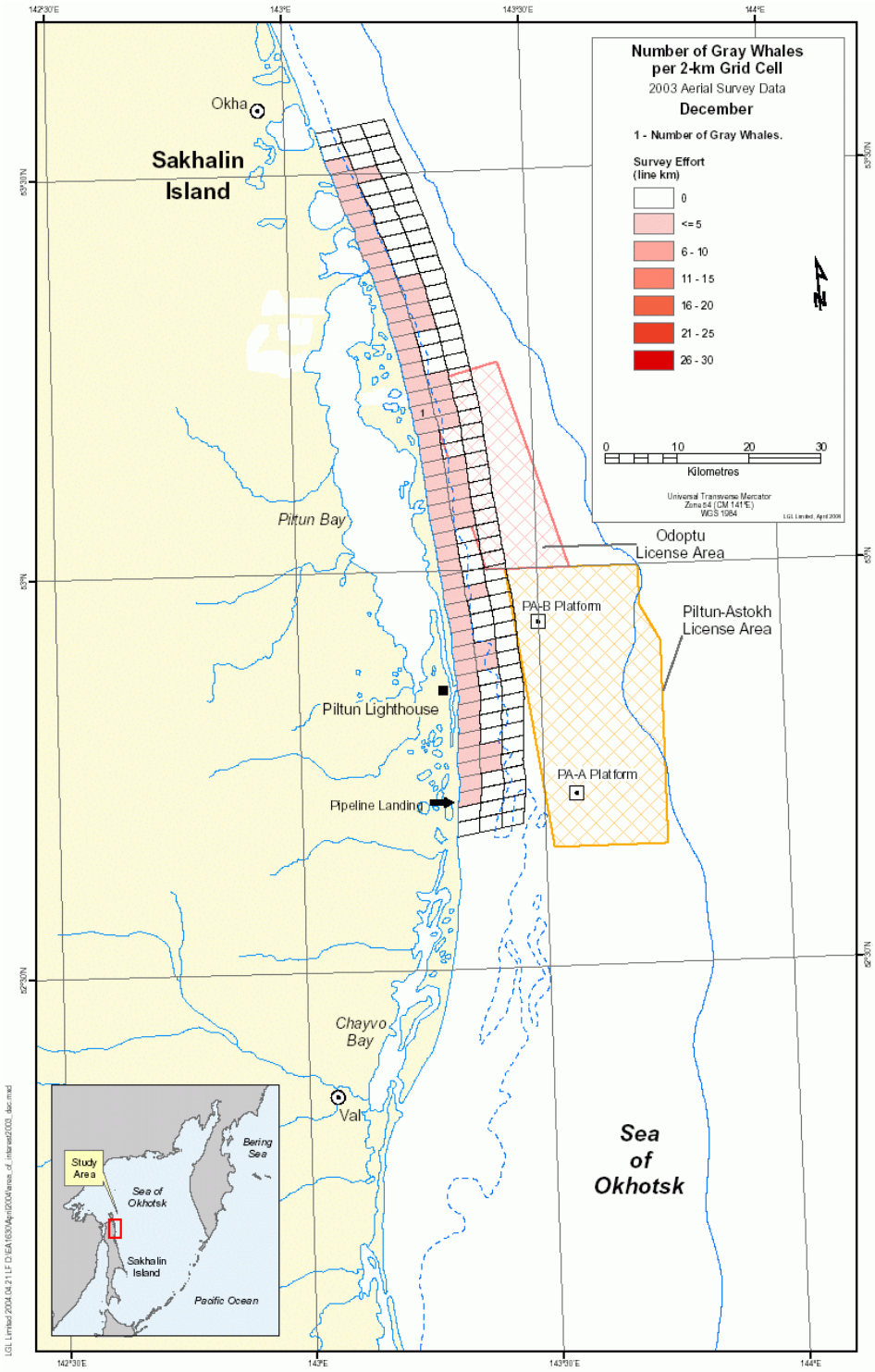


Figure 28. Survey effort (kilometers traveled through each 2x3 km grid cell), 29 November and 2 December, 2003. Number of gray whales sighted within a cell is shown in the cell (on transect sightings only, all Intensive and Extensive surveys, including partial ones).

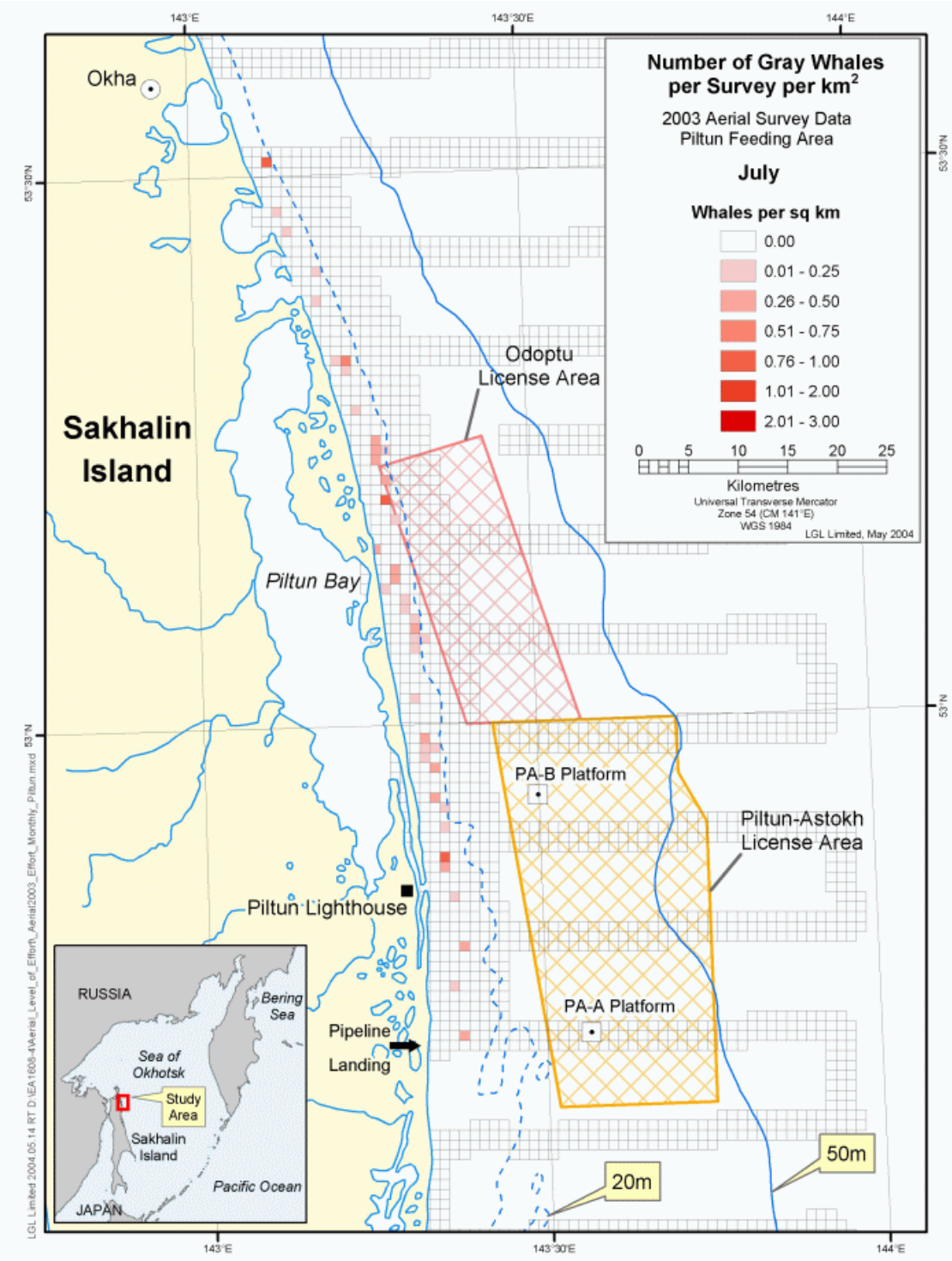


Figure 29. Relative density of gray whales (number of whales seen per 1 km^2), July 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Intensive and Extensive surveys, including partial ones).

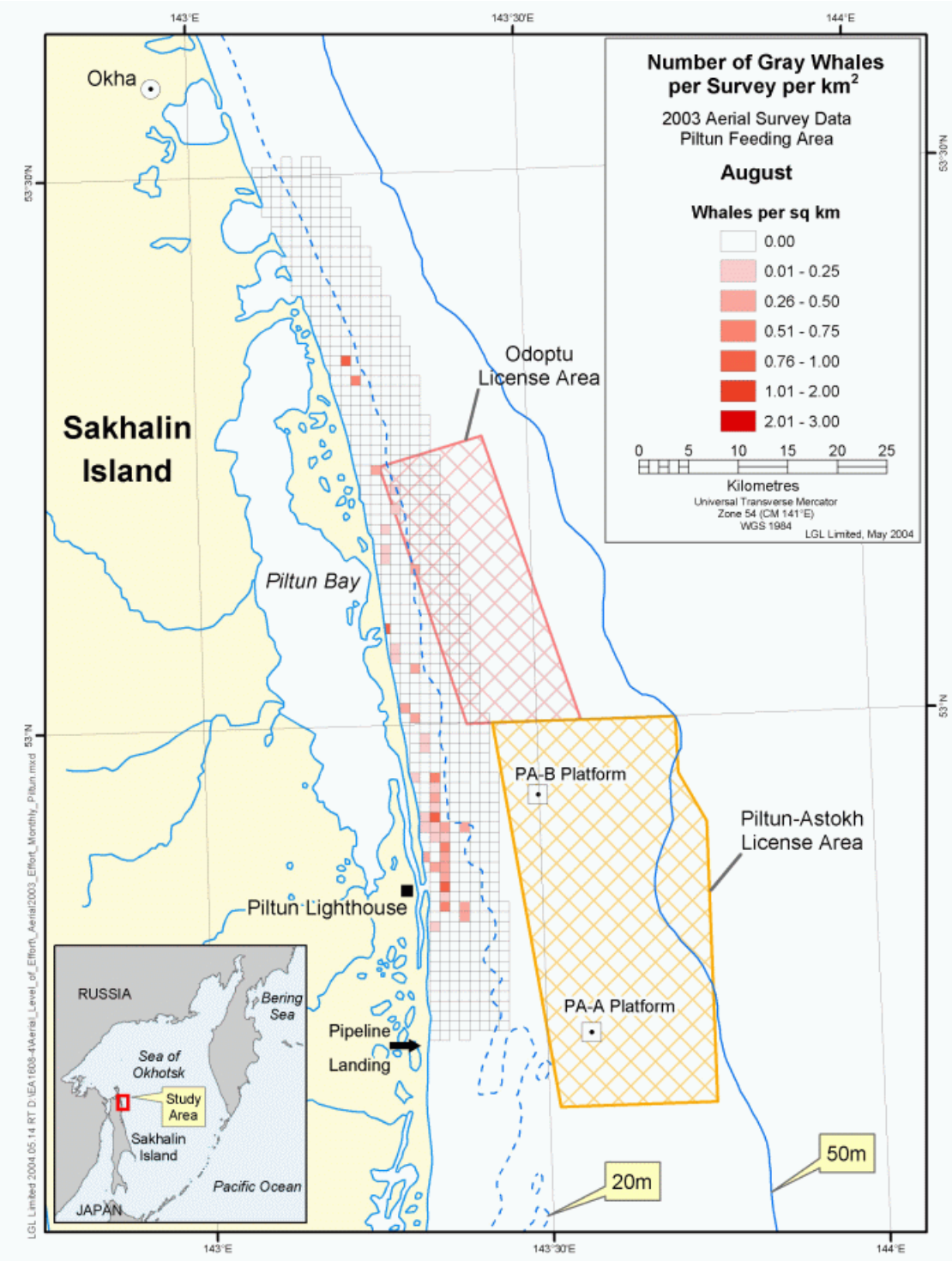


Figure 30. Relative density of gray whales (number of whales seen per 1 km^2), August 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Intensive surveys, including partial ones).

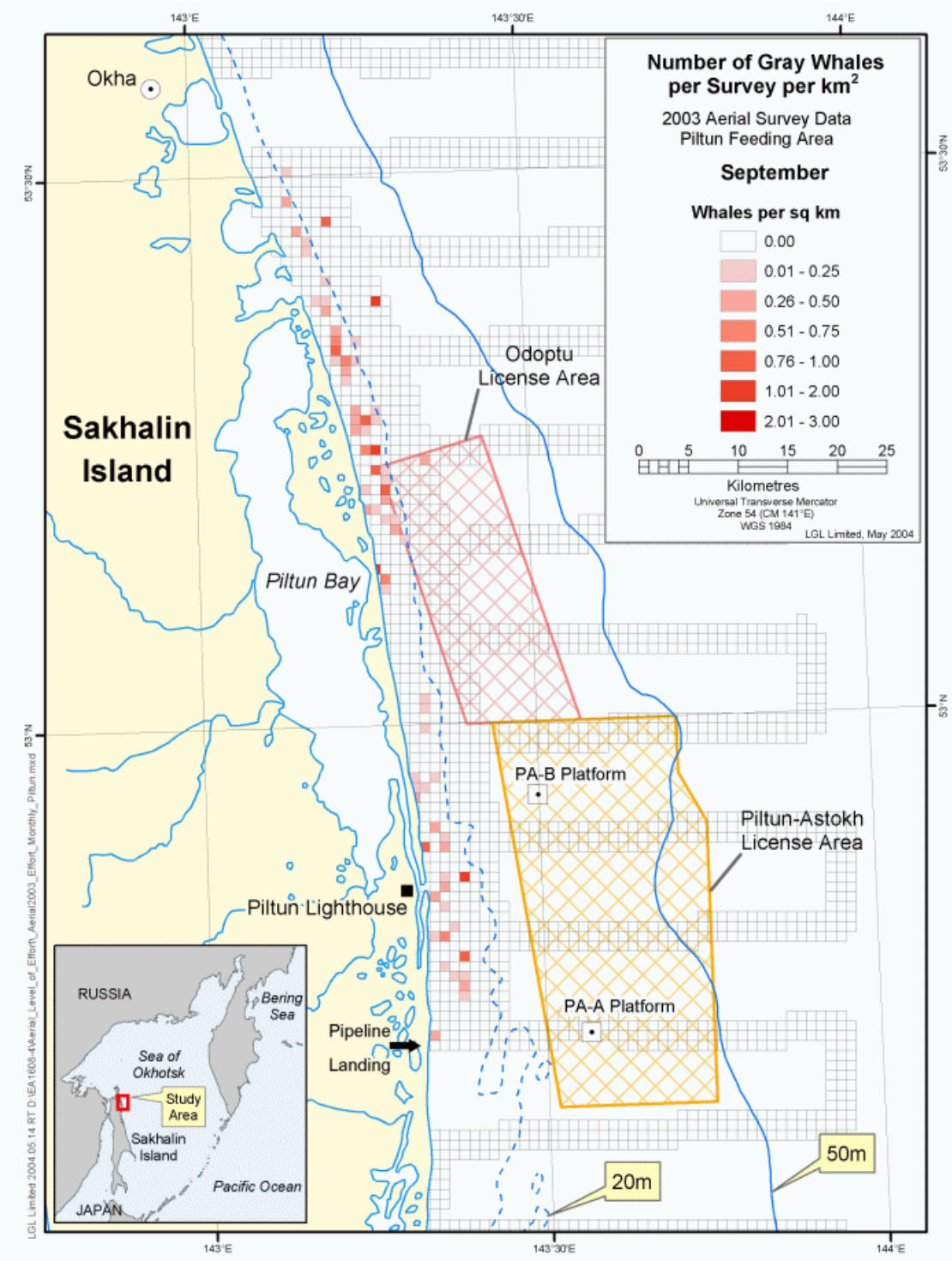


Figure 31. Relative density of gray whales (number of whales seen per 1 km^2), September 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Intensive and Extensive surveys, including partial ones).

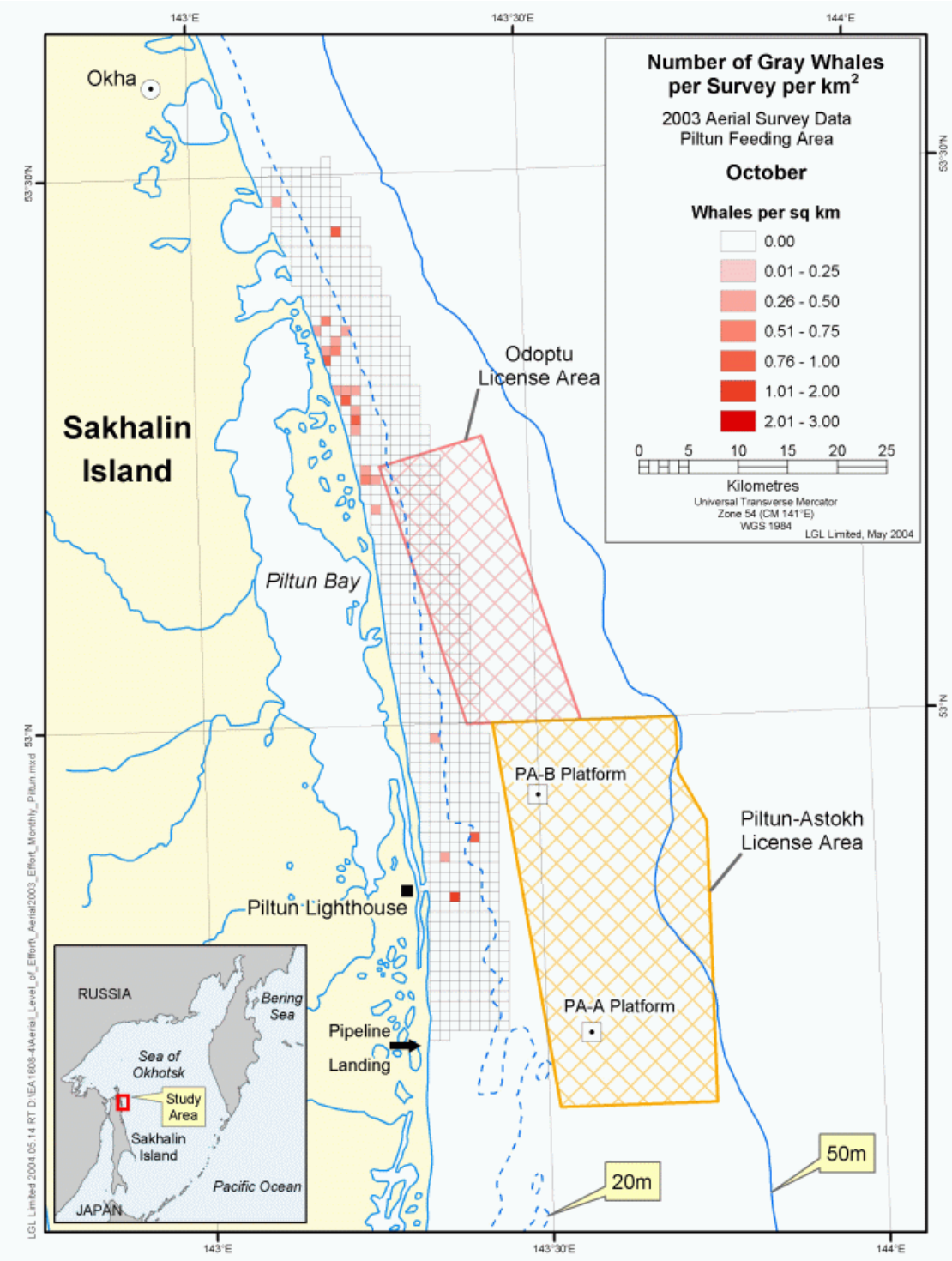


Figure 32. Relative density of gray whales (number of whales seen per 1 km^2), October 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Intensive surveys, including partial ones).

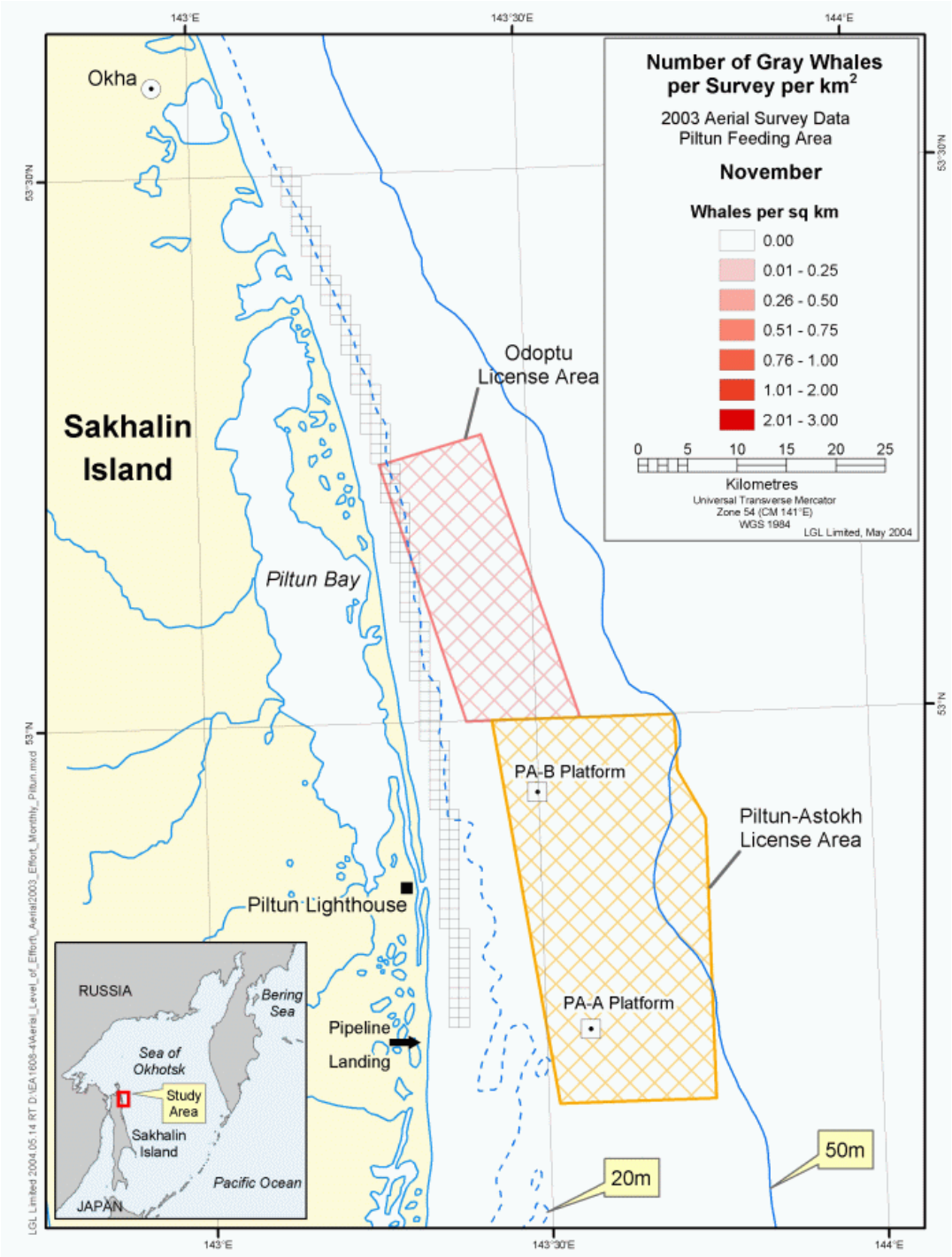


Figure 33. Relative density of gray whales (number of whales seen per 1 km^2), 29 November and 2 December 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Intensive surveys, including partial ones).

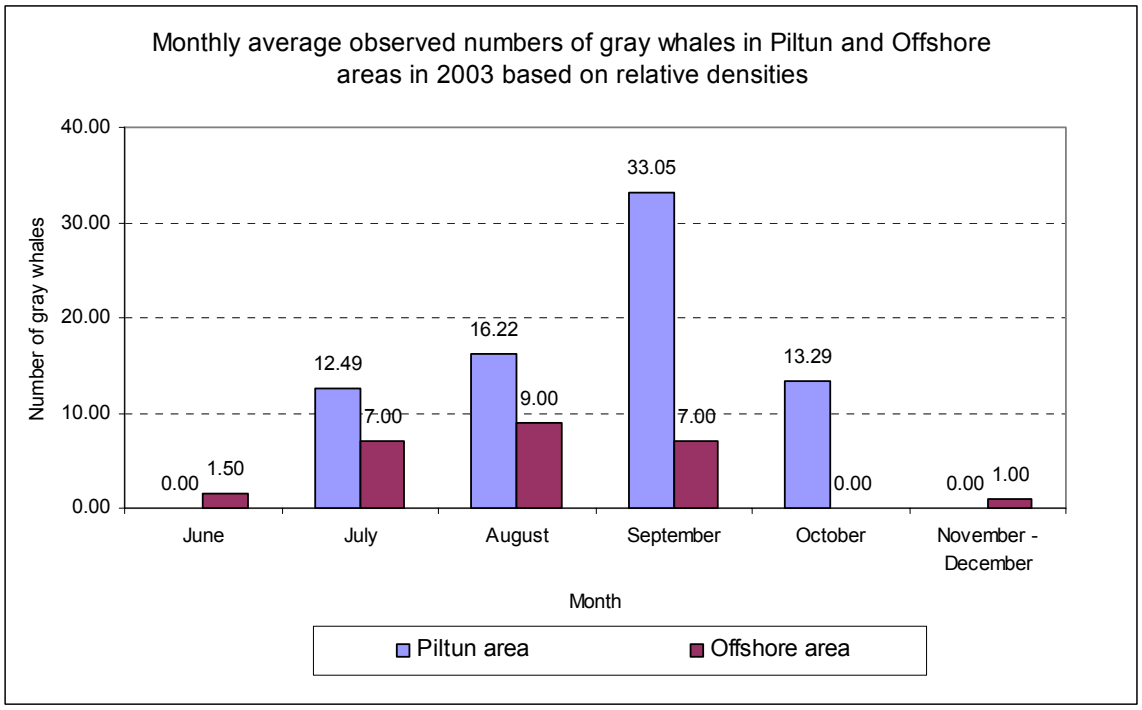


Figure 34. Total monthly average observed numbers of gray whales in Piltun and in Offshore areas in 2003, based on relative densities (on-transect sightings, full and partial surveys).

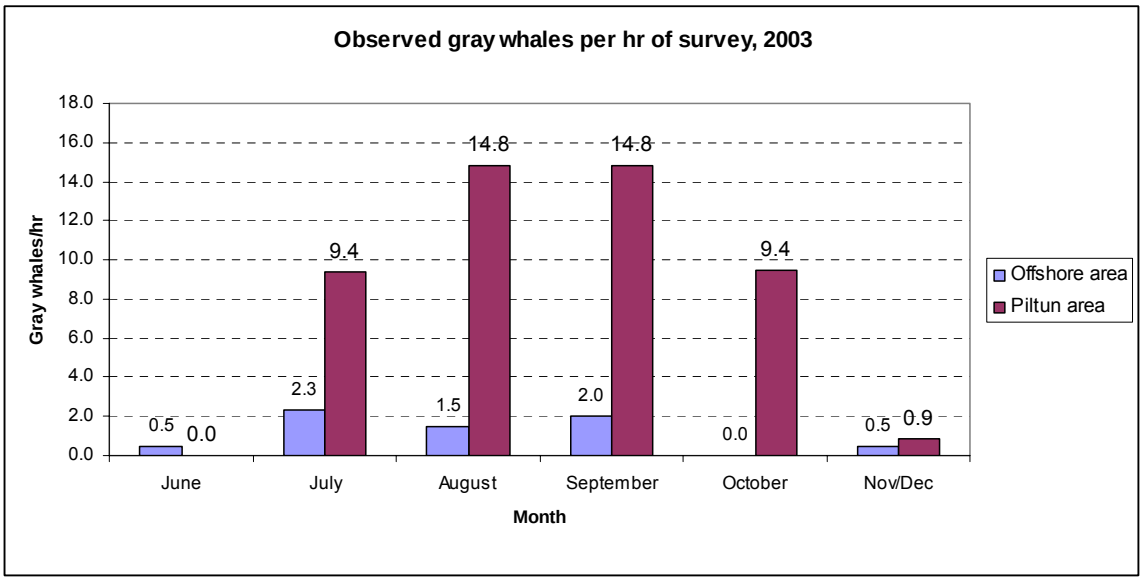


Figure 35. The number of on-transect observed gray whales per hour of aerial survey in the Offshore and Piltun areas, 2003.

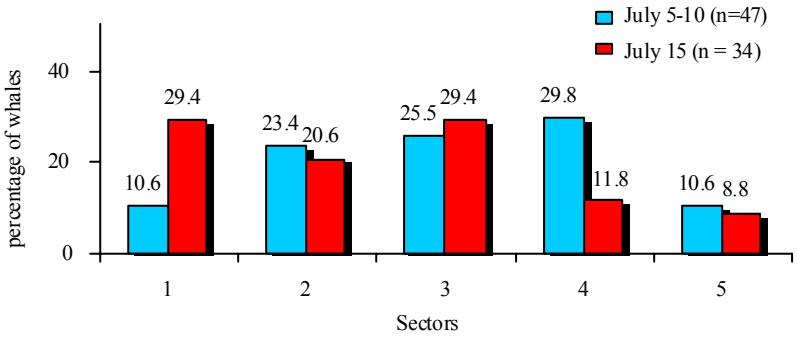


Figure 36. Distribution of gray whales along the shore in the Piltun area, July 2003, all Intensive survey, on- and off-transect sightings

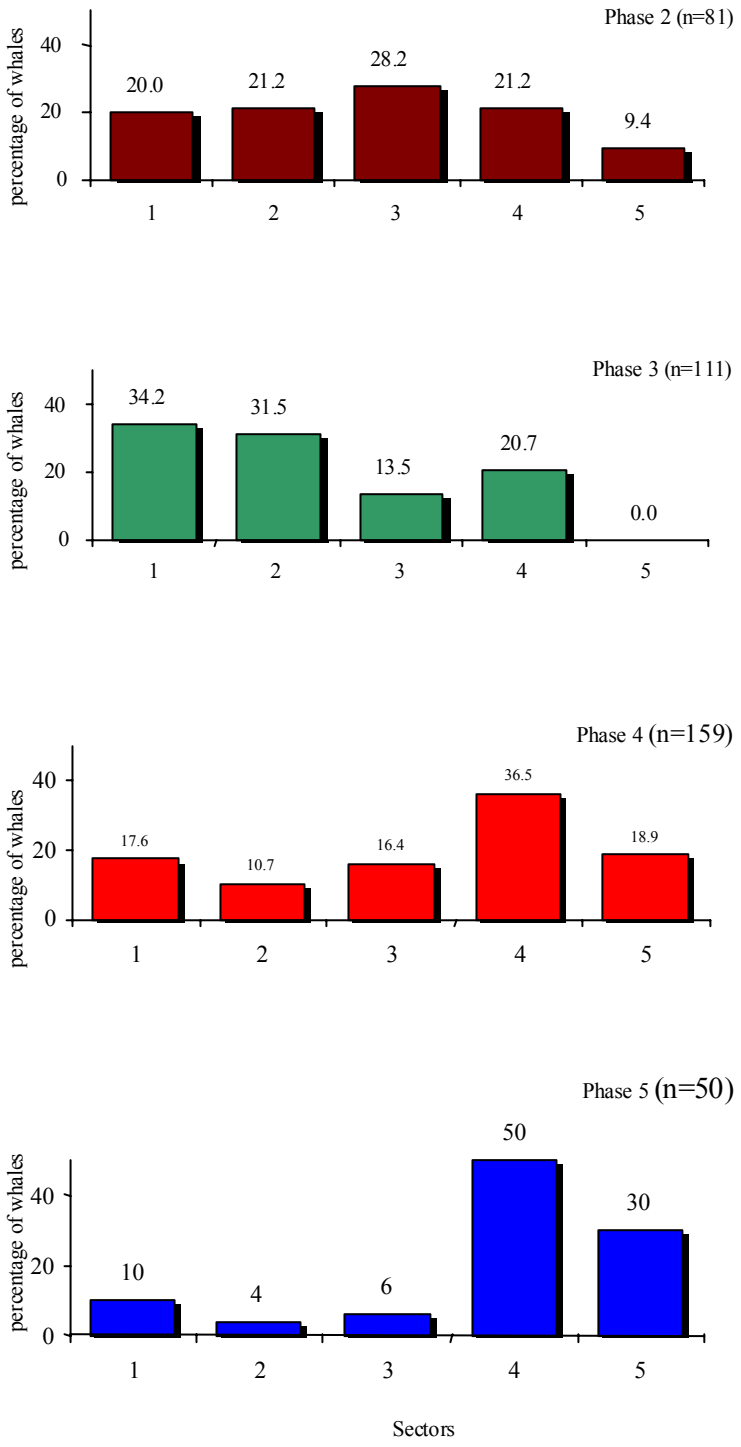


Figure 37. Monthly distribution of gray whales along the shore in the Piltun area by sectors in July – October 2003, all Intensive survey, on- and off-transect sightings.

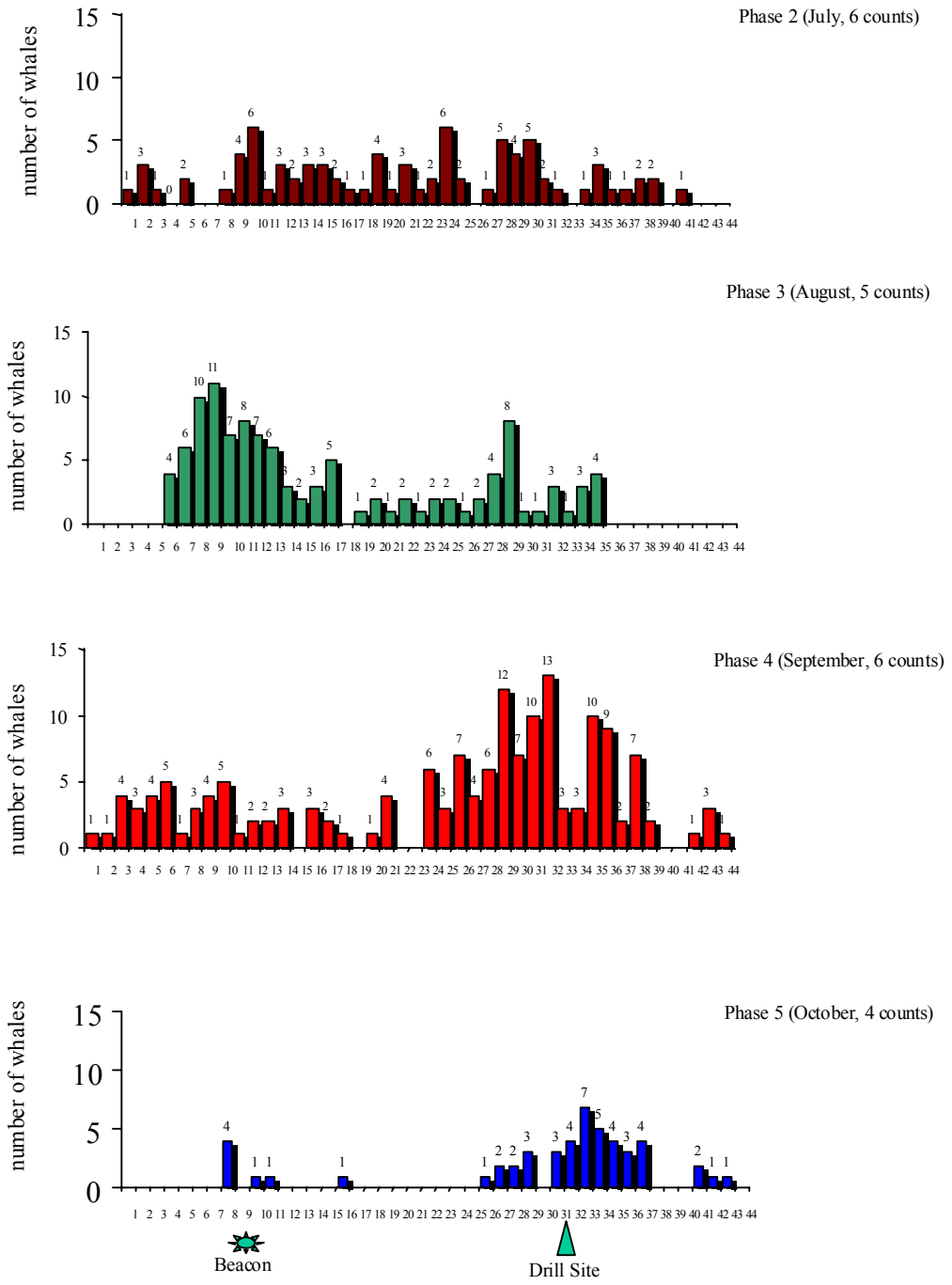


Figure 38. Monthly distribution of gray whales along the shore in the Piltun area by 2-km mini-sectors (Figure 6) in July – October 2003, all Intensive survey, on- and off-transect sightings. North is on the right.

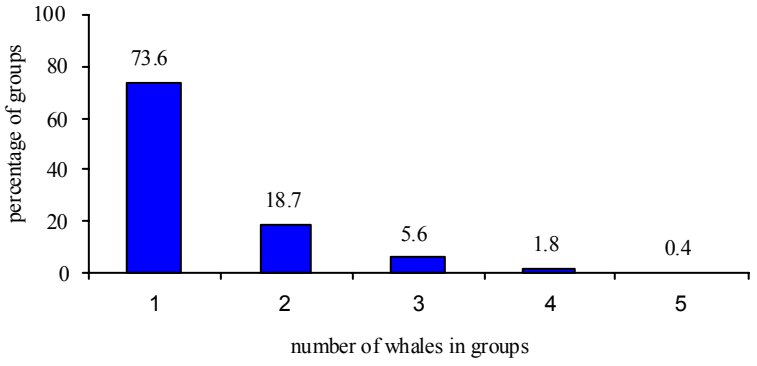


Figure 39. Group size among gray whales in Piltun area in July – October 2003, Intensive survey, on-transect sightings.

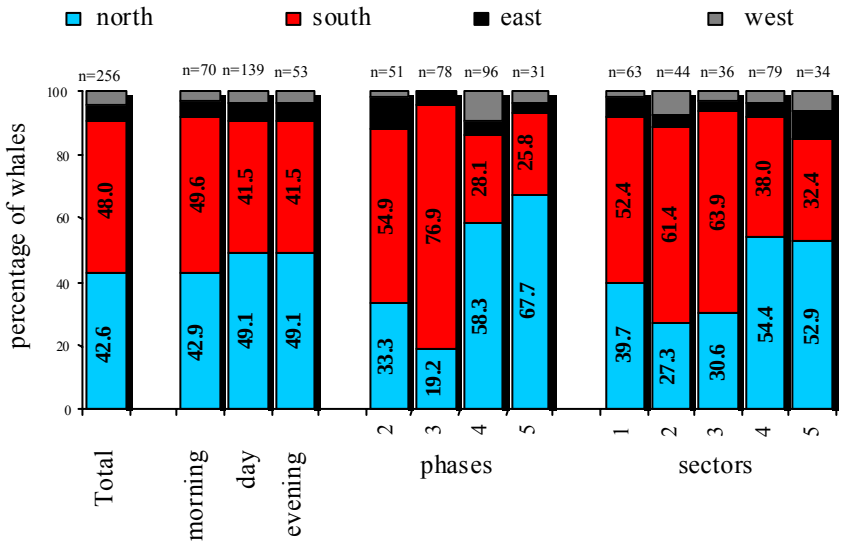
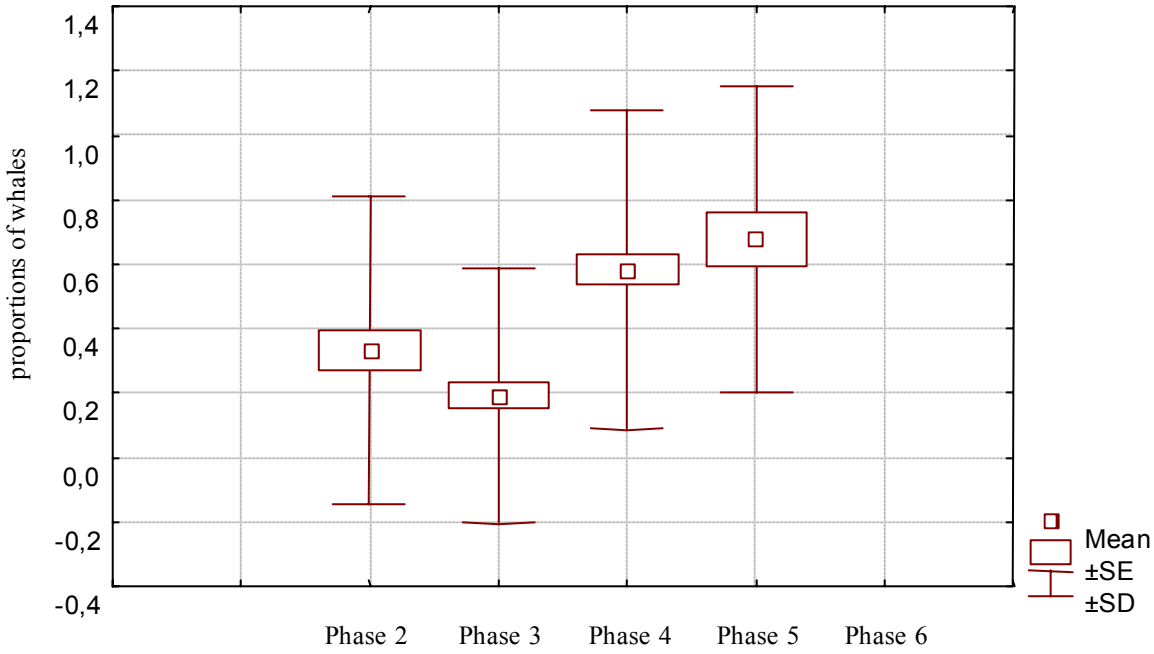
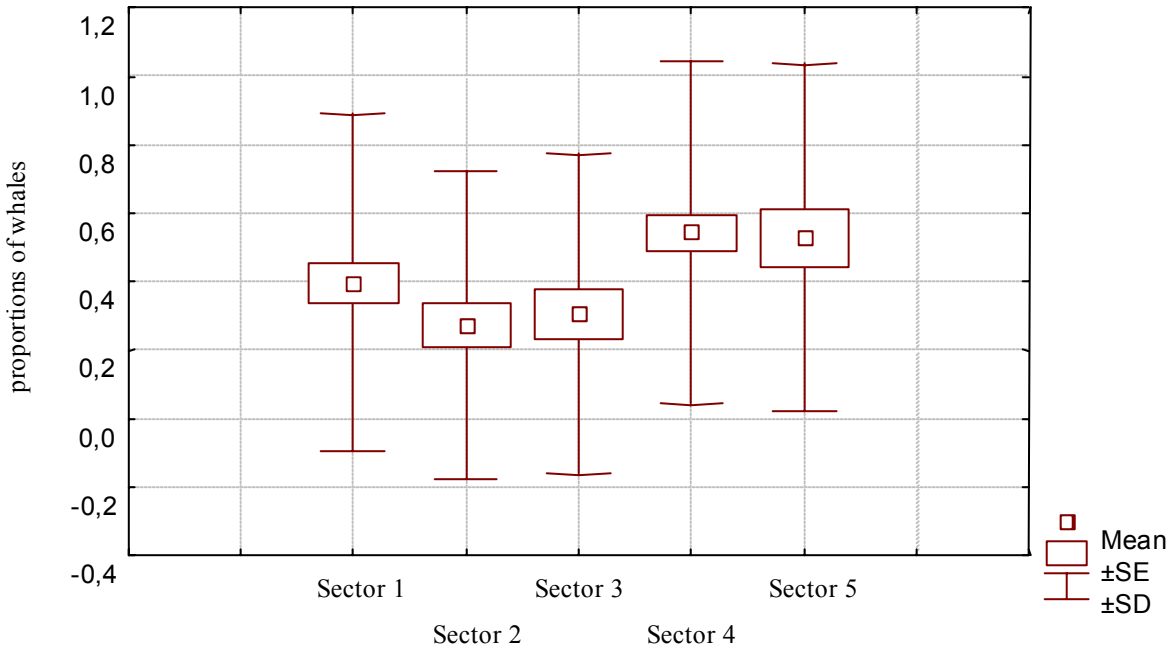


Figure 40. Directional orientation of observed gray whales in Piltun area in July – October 2003 by the time of the day, month (stage) and sector (all Intensive survey, on- and off-transect sightings).



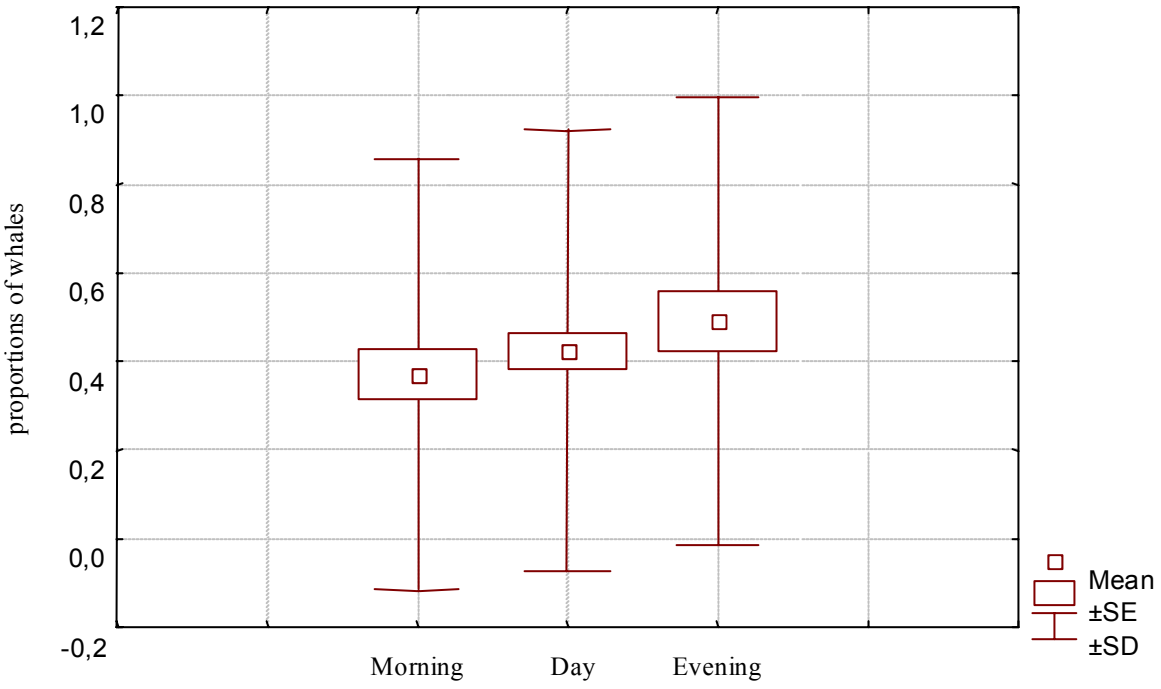
Group 1 vs. Group 2	T-test						
	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2
Phase 3 vs. Phase 4	0,19	0,58	-5,65	172	0,00	78	96
Phase 3 vs. Phase 5	0,19	0,68	-5,44	107	0,00	78	31

Figure 41. Proportion of observed gray whales in Piltun area oriented north in July – November 2003 by month (stage) (all Intensive survey, on- and off-transect sightings). The table shows that the differences in pairs August-September and August-October are statistically significant.



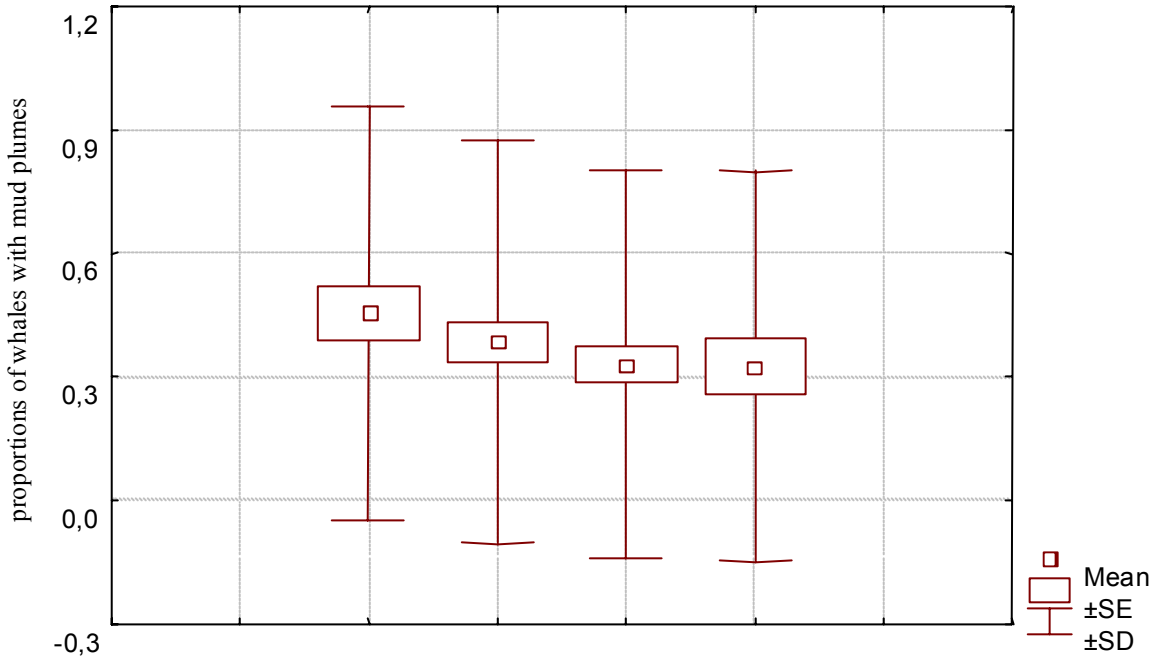
Group 1 vs. Group 2	T-test						
	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2
Sector 2 vs. Sector 3	0,27	0,31	-0,32	78	0,75	44	36
Sector 2 vs. Sector 4	0,27	0,54	-2,98	121	0,00	44	79
Sector 2 vs. Sector 5	0,27	0,53	-2,36	76	0,02	44	34

Figure 42. Proportion of observed gray whales in Piltun area oriented north in July – October 2003 by sector (all Intensive survey, on- and off-transect sightings). The table shows that the differences in pairs Sector 2 – Sector 4 and Sector 2 – Sector 5 are statistically significant.



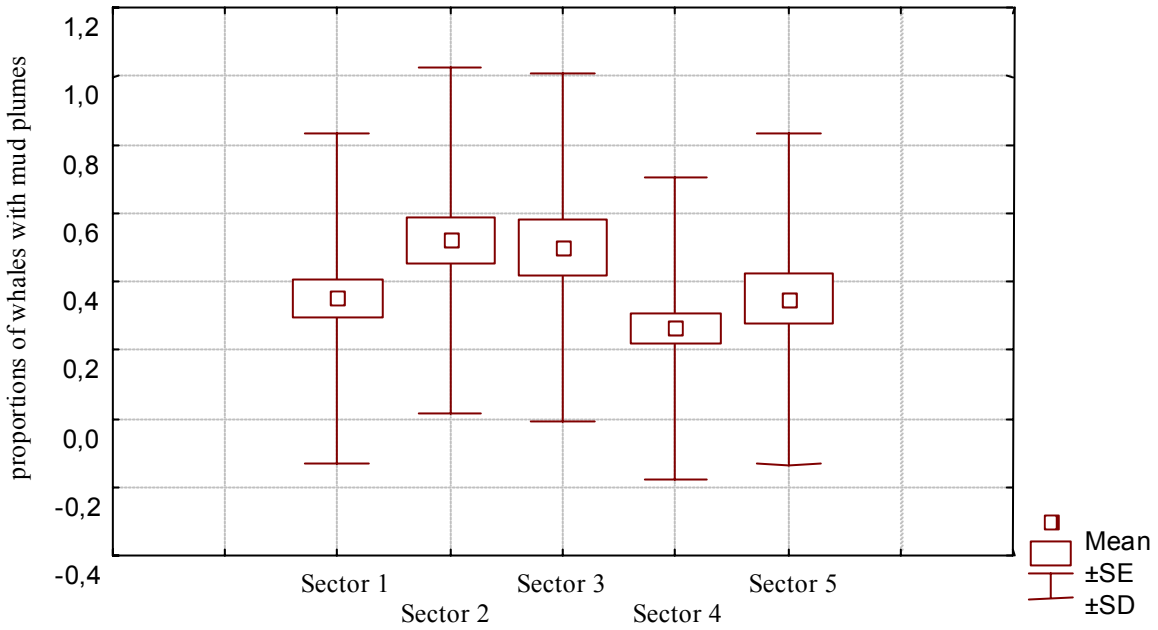
Group 1 vs. Group 2	t-test						
	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2
morning vs. evening	0,37	0,49	-1,32	121	0,19	70	53

Figure 43. Proportion of observed gray whales in Piltun area oriented north in July – October 2003 by the time of the day (all Intensive survey, on- and off-transect sightings). No statistically significant differences in orientation were found.



Group 1 vs. Group 2	T-test						
	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2
Phase 2 vs. Phase 3	0,45	0,38	0,83	144	0,41	55	91
Phase 2 vs. Phase 4	0,45	0,33	1,56	165	0,12	55	112
Phase 2 vs. Phase 5	0,45	0,33	1,29	96	0,20	55	43

Figure 44. Feeding index of gray whales observed in Piltun area, July – October 2003 (all Intensive surveys, on-transect sightings).



Group 1 vs. Group 2	T-test						
	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2
Sector 2 vs. Sector 3	0,52	0,50	0,18	84	0,86	50	36
Sector 2 vs. Sector 4	0,52	0,26	3,16	143	0,00	50	95
Sector 2 vs. Sector 5	0,52	0,35	1,62	88	0,11	50	40

Figure 45. Feeding index of gray whales observed in Piltun area in 2003 by sectors (all Intensive surveys, on-transect sightings).

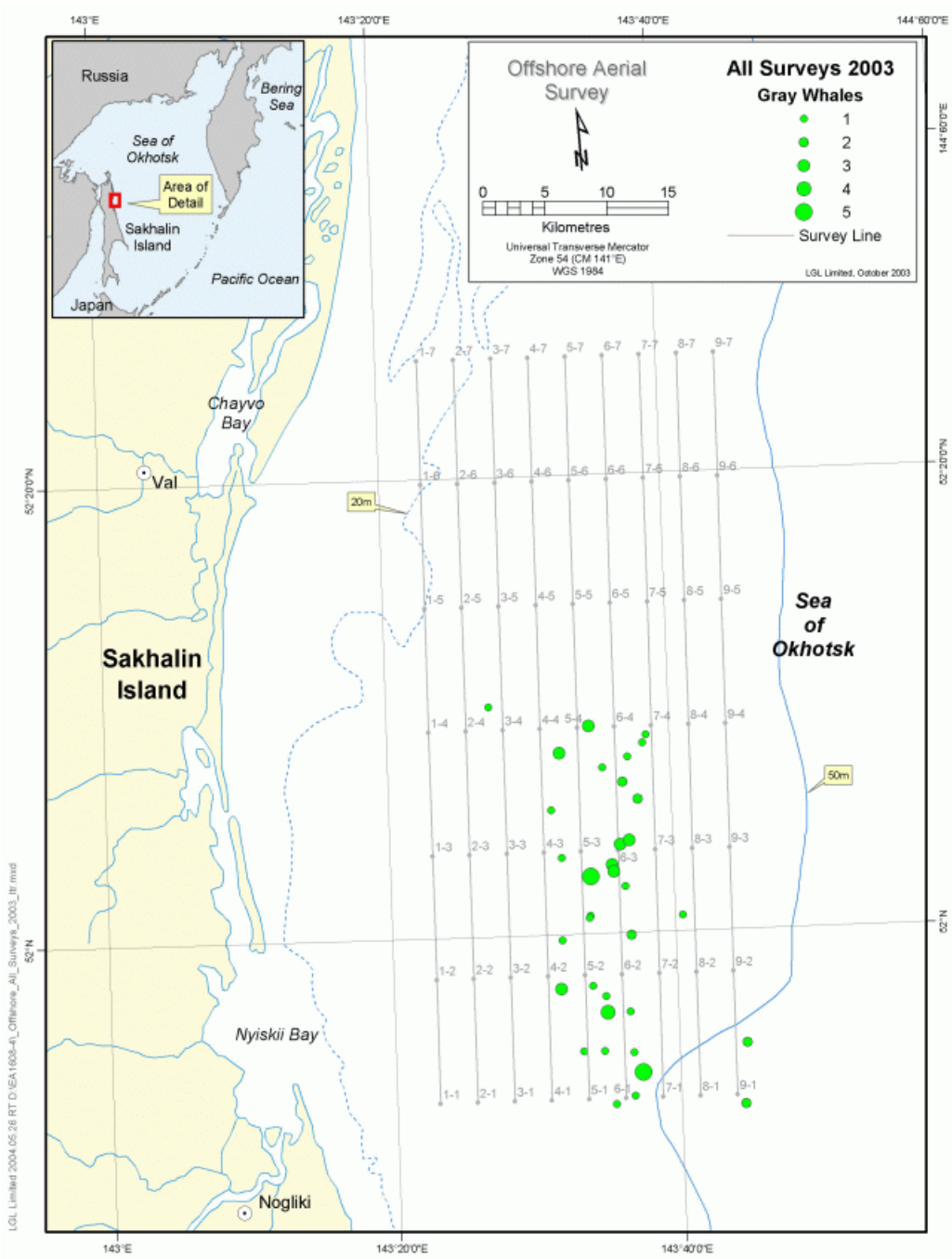


Figure 46. All gray whale sightings in the Offshore Area in June-December 2003 (all Offshore and Extensive grid aerial surveys, aircraft An-28, on- and off-transect sightings, 500 m ASL).

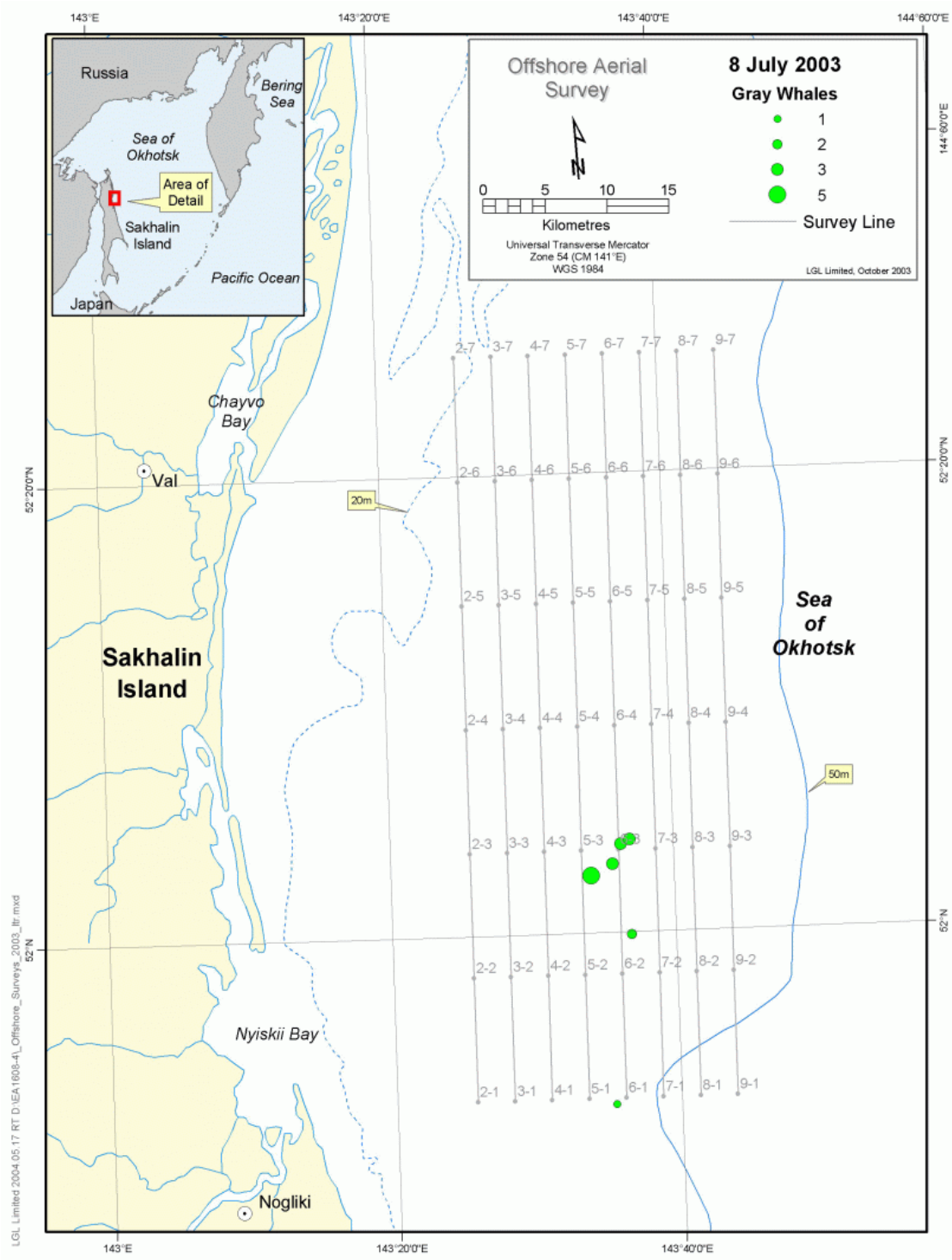


Figure 47. Gray whale sightings in the Offshore Area on 8 July 2003 (Offshore grid aerial survey, aircraft An-28, on- and off-transect sightings, 500 m ASL). Only lines flown are displayed.

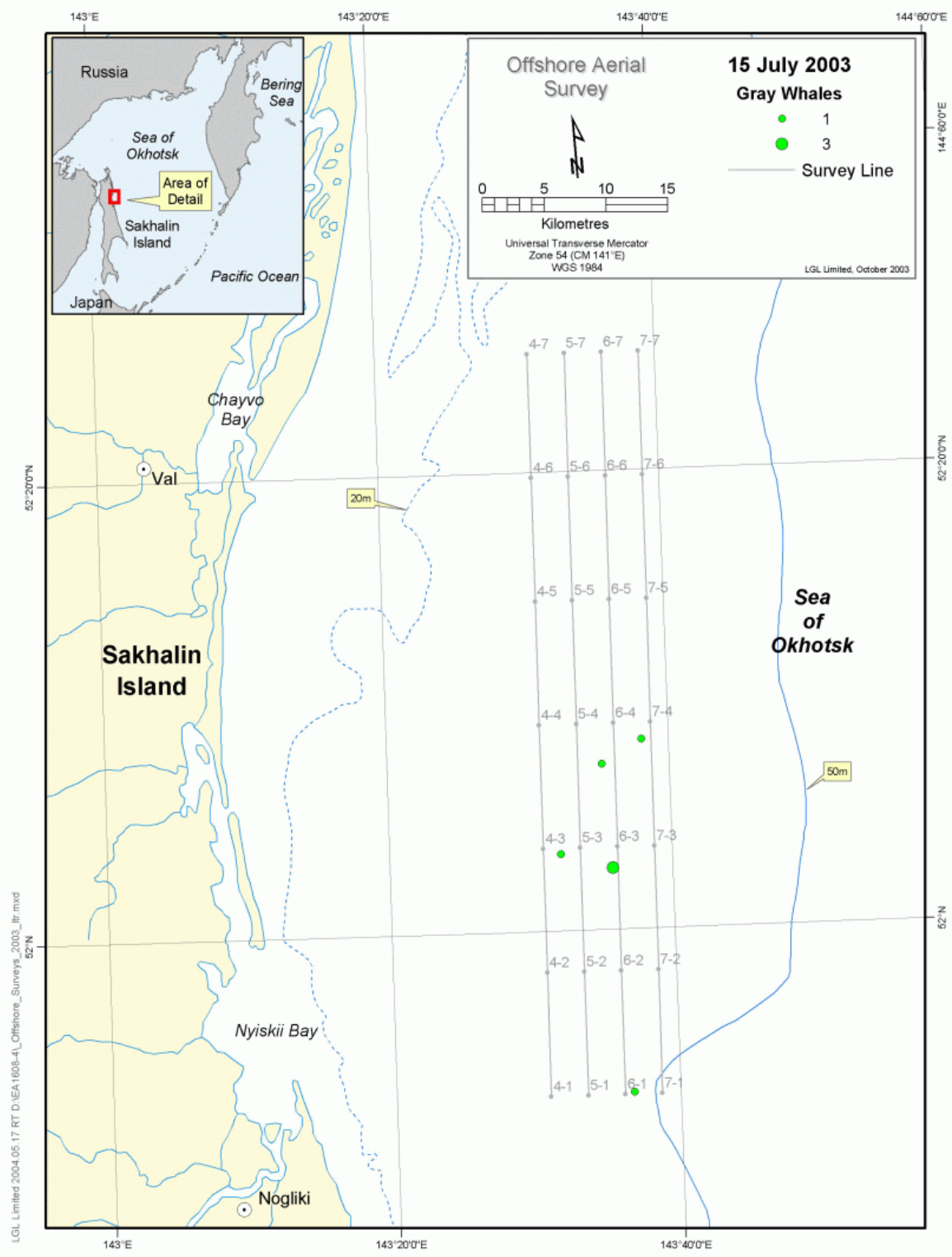


Figure 48. Gray whale sightings in the Offshore Area on 15 July 2003 (Offshore grid aerial survey, aircraft An-28, on- and off-transect sightings, 500 m ASL). Only lines flown are displayed.

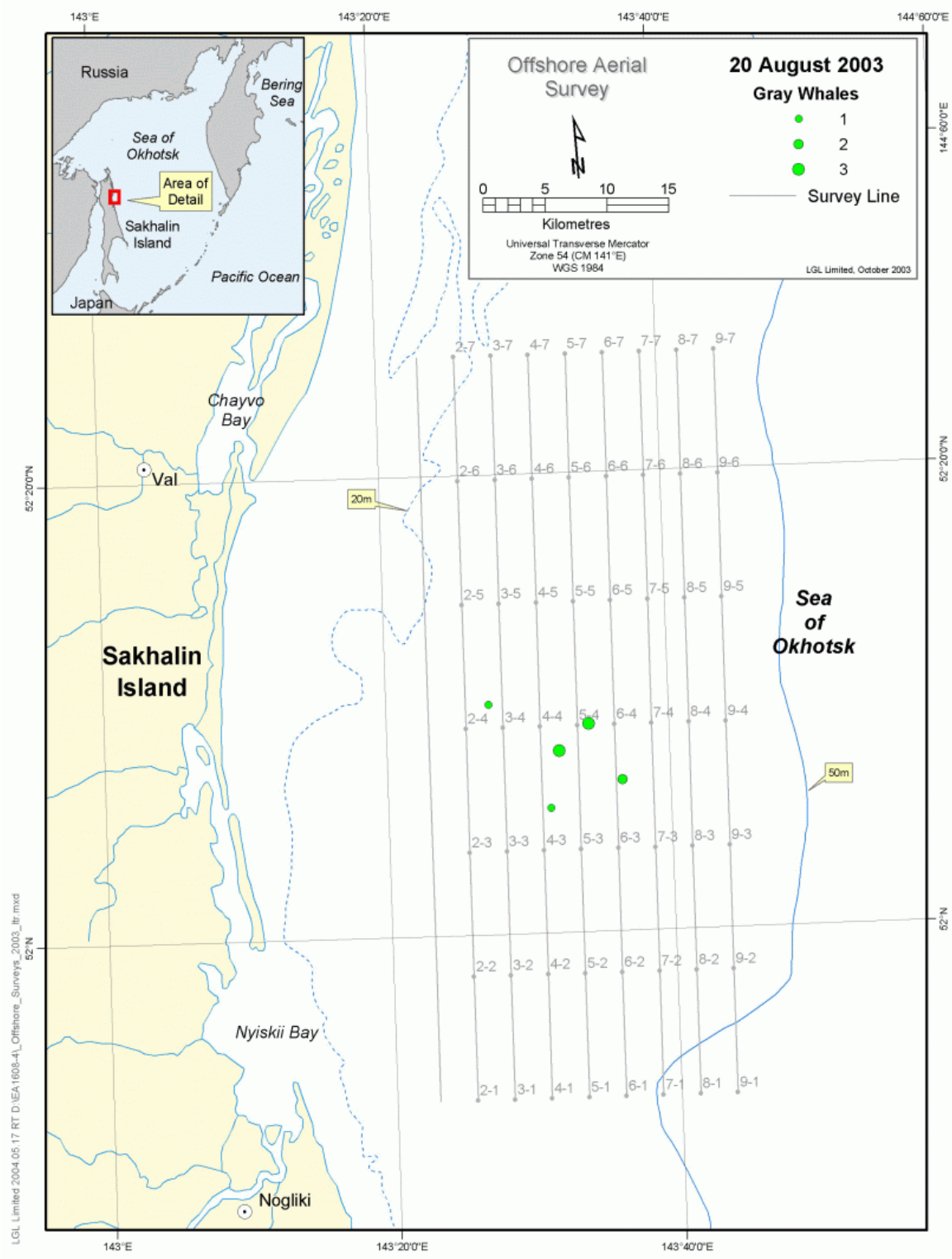


Figure 49. Gray whale sightings in the Offshore Area on 20 August 2003 (Offshore grid aerial survey, aircraft An-28, on- and off-transect sightings, 500 m ASL). Only lines flown are displayed.

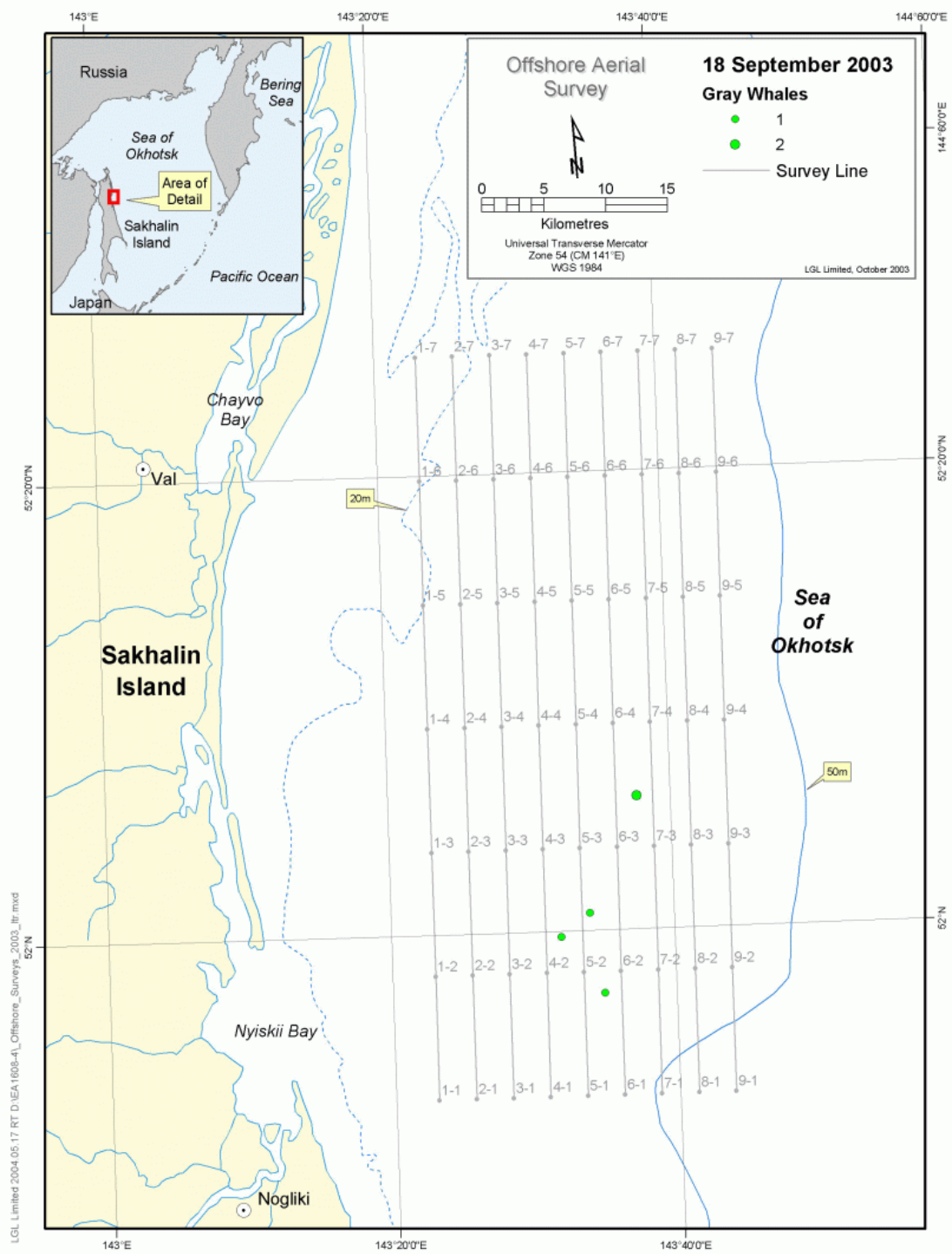


Figure 50. Gray whale sightings in the Offshore Area on 18 September 2003 (Offshore grid aerial survey, aircraft An-28, on- and off-transect sightings, 500 m ASL). Only lines flown are displayed.

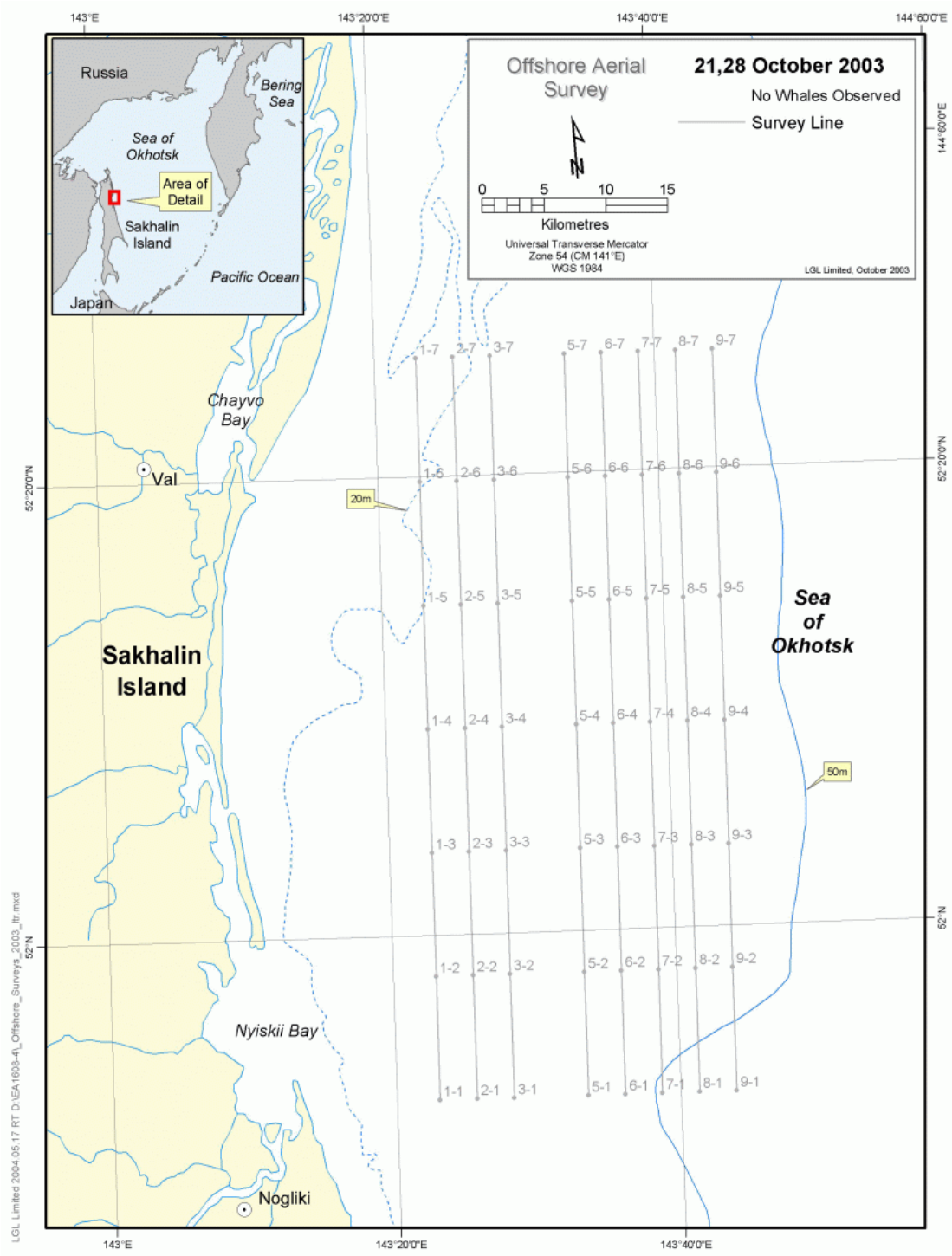


Figure 51. Gray whale sightings in the Offshore Area on 21, 28 October 2003 (Offshore grid aerial survey, aircraft An-28, on- and off-transect sightings, 500 m ASL). Only lines flown are displayed.

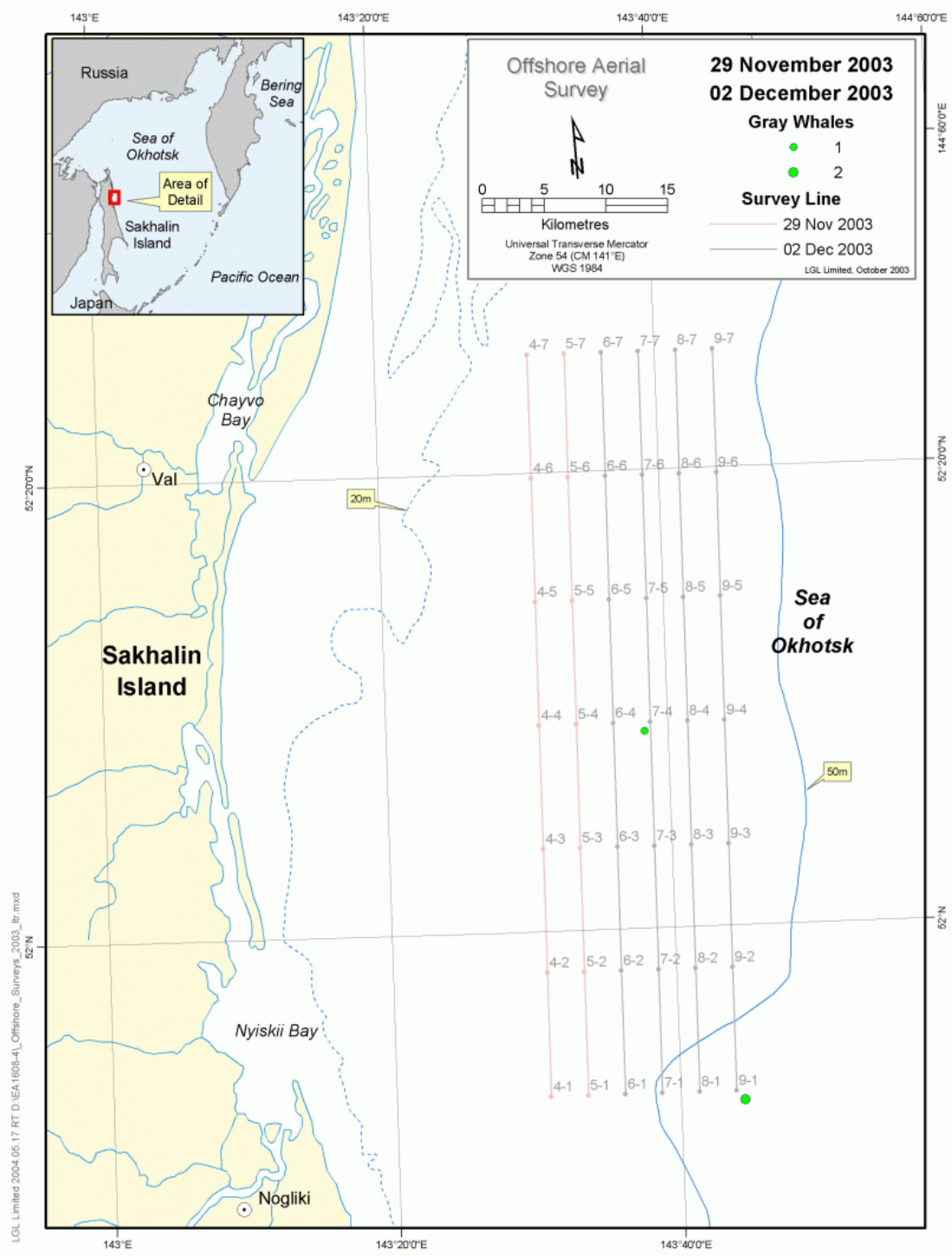


Figure 52. Gray whale sightings in the Offshore Area on 29 November and 2 December 2003 (Offshore grid aerial survey, aircraft An-28, on- and off-transect sightings, 500 m ASL). Only lines flown are displayed.

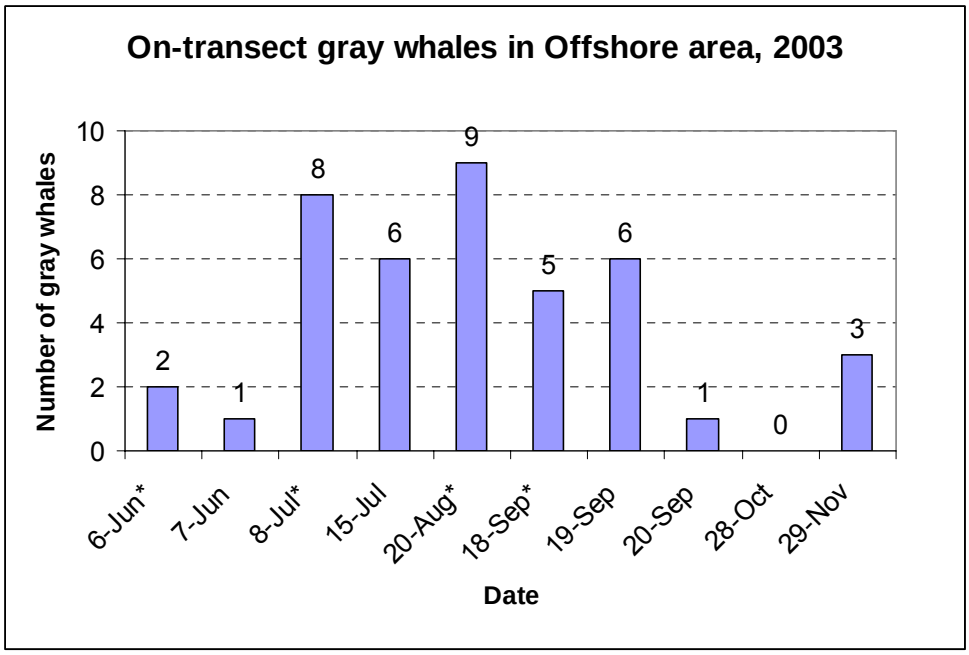


Figure 53. On-transect gray whales sighted during the Offshore grid aerial surveys in 2003. Near-full surveys (7-9 lines) are indicated by (*).

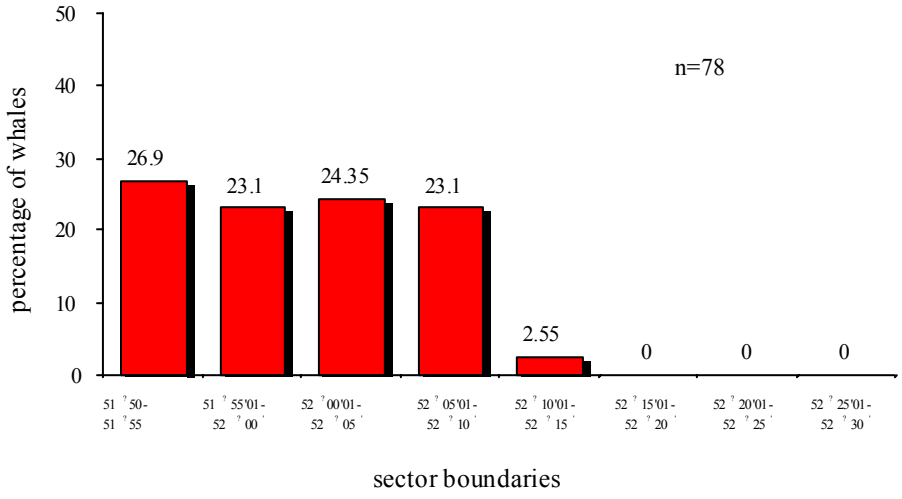


Figure 54. Latitudinal distribution, on- and off-transect gray whales sighted during the Offshore grid aerial surveys in 2003.

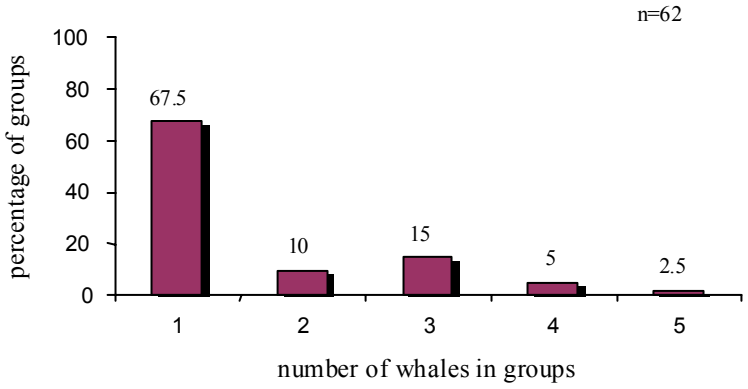


Figure 55. Group sizes of gray whales in the Offshore area in 2003 (on-transect sightings).

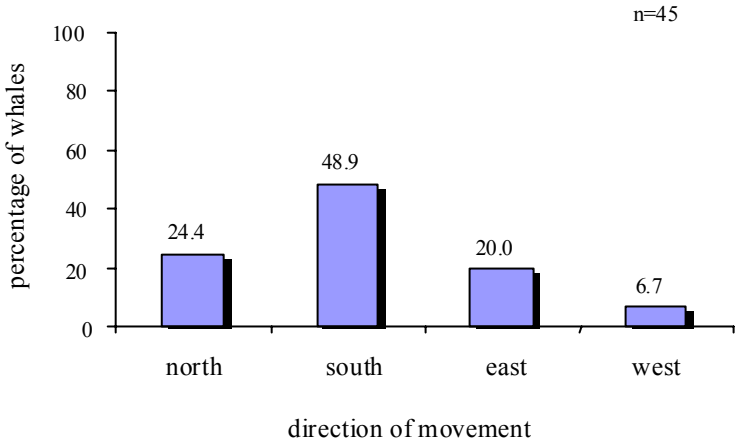
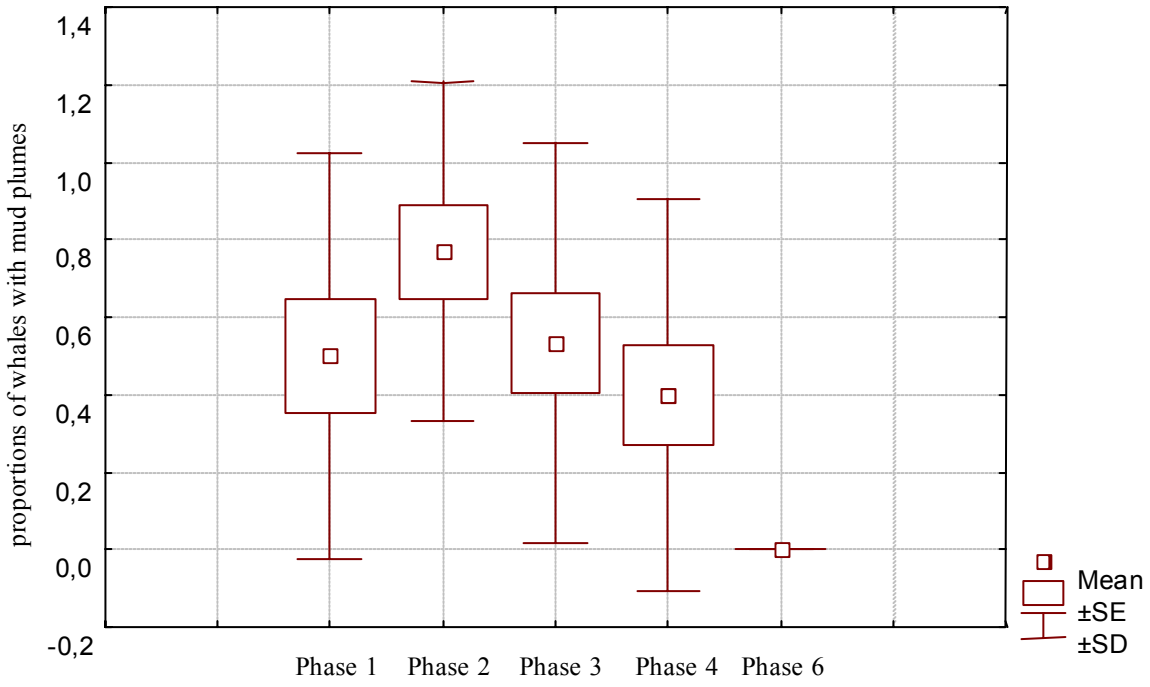
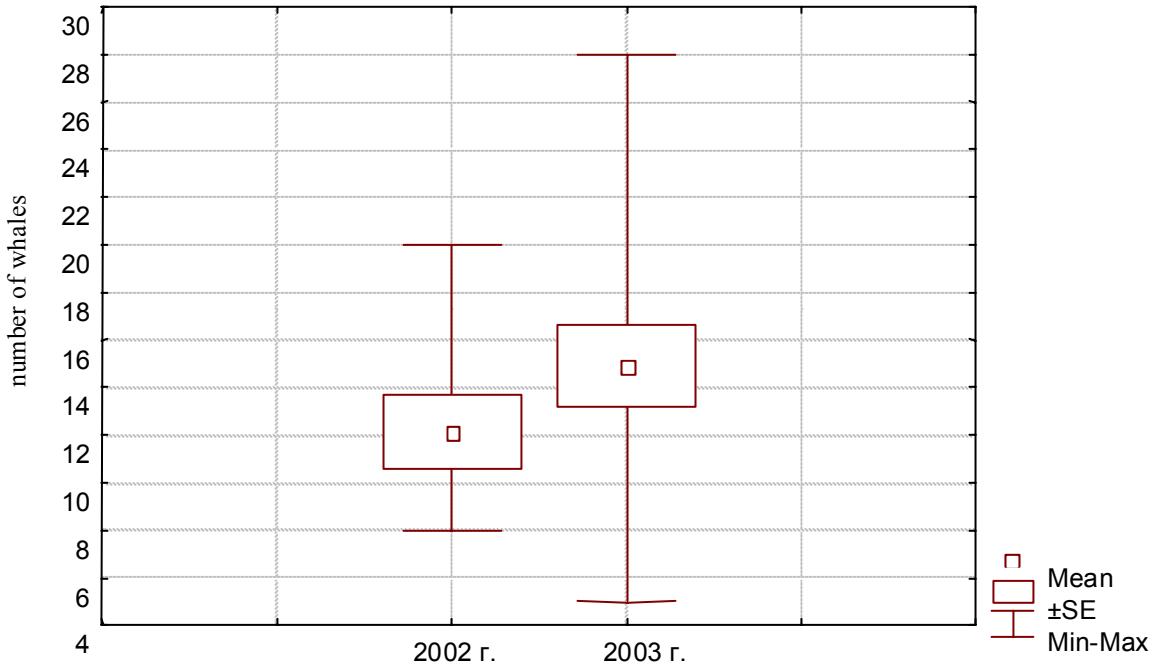


Figure 56. Directional orientation of gray whales sighted on-transect in the Offshore grid aerial surveys in 2003.



Group 1 vs. Group 2	T-test						
	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2
Phase 2 vs. Phase 4	0,77	0,40	2,04	26	0,05	13	15

Figure 57. Feeding index of gray whales in the Offshore area in 2003 broken down by month (Phases, or sets of aerial surveys), Offshore grid surveys, on-transect sightings.



Group 1 vs. Group 2	T-test						
	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2
2002 vs. 2003	12,14	14,93	-1,02	19	0,32	7	14

Figure 58. Average number of gray whales observed on individual surveys in August-October of 2002 vs. 2003 (on-transect sightings only).

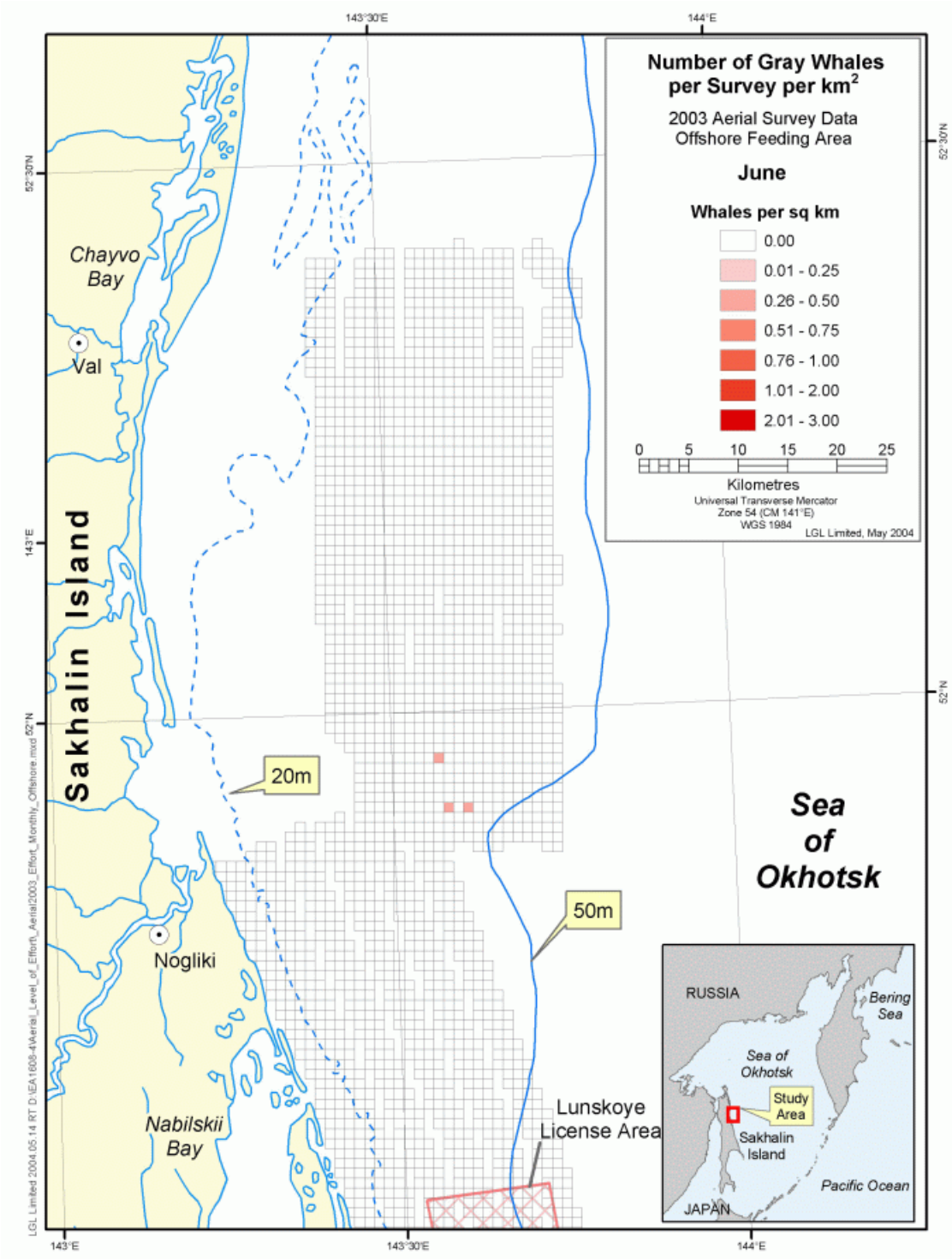


Figure 59. Relative density of gray whales in the Offshore area (number of whales seen per 1 km^2), June 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Offshore grid surveys, including partial ones).

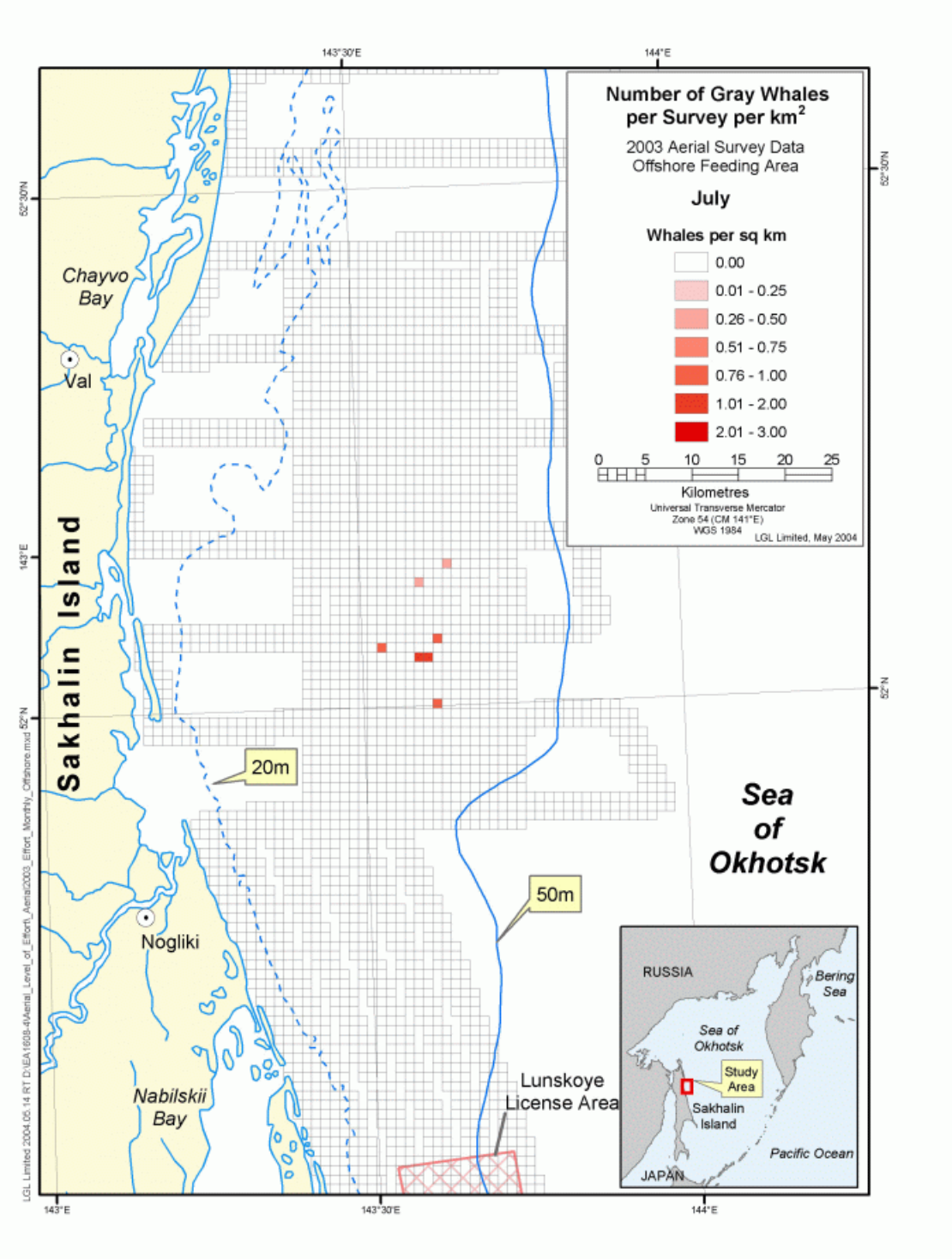


Figure 60. Relative density of gray whales in the Offshore area (number of whales seen per 1 km^2), July 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Offshore grid surveys, including partial ones, and Extensive survey).

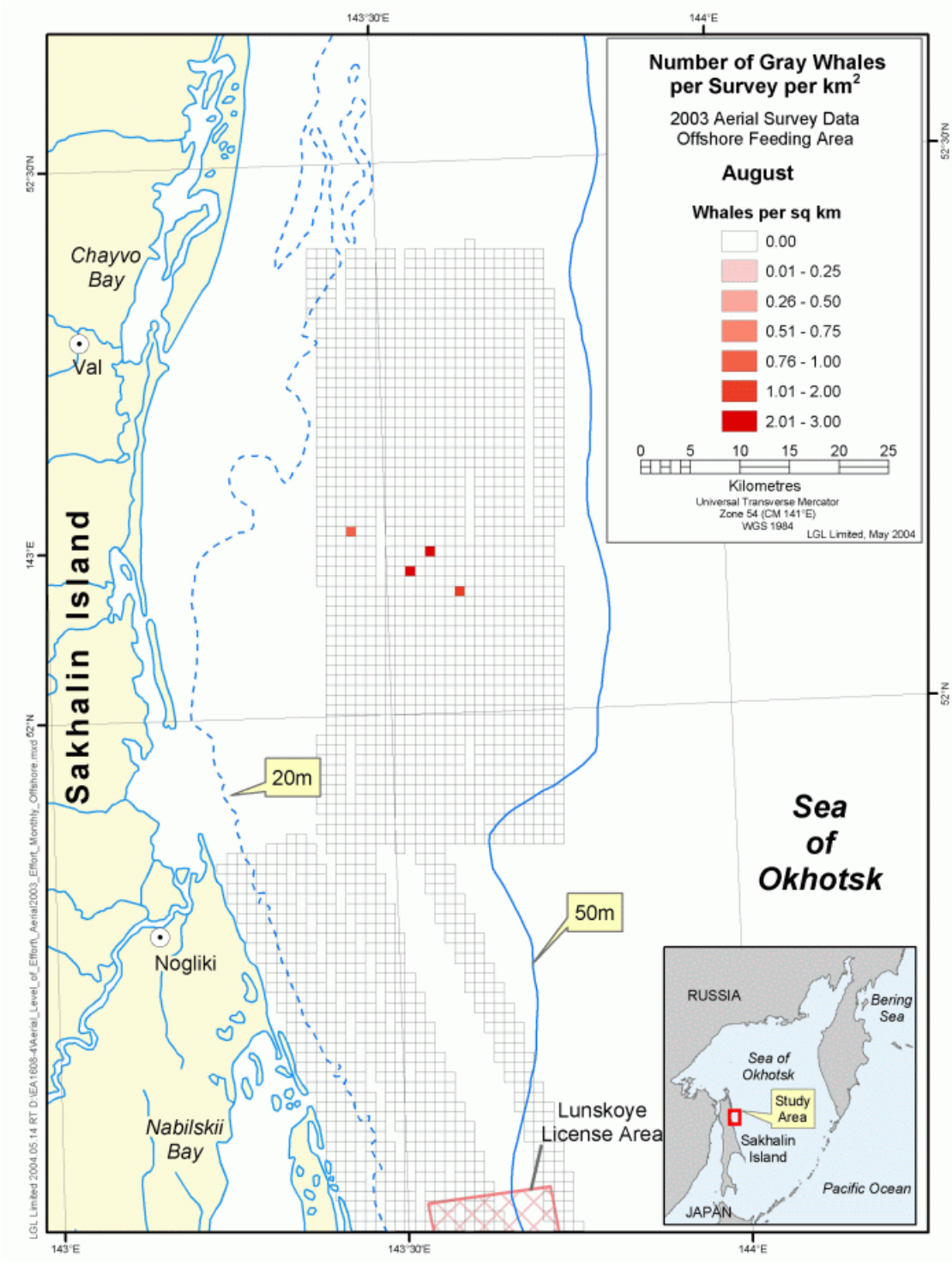


Figure 61. Relative density of gray whales in the Offshore area (number of whales seen per 1 km^2), August 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Offshore grid surveys, including partial ones).

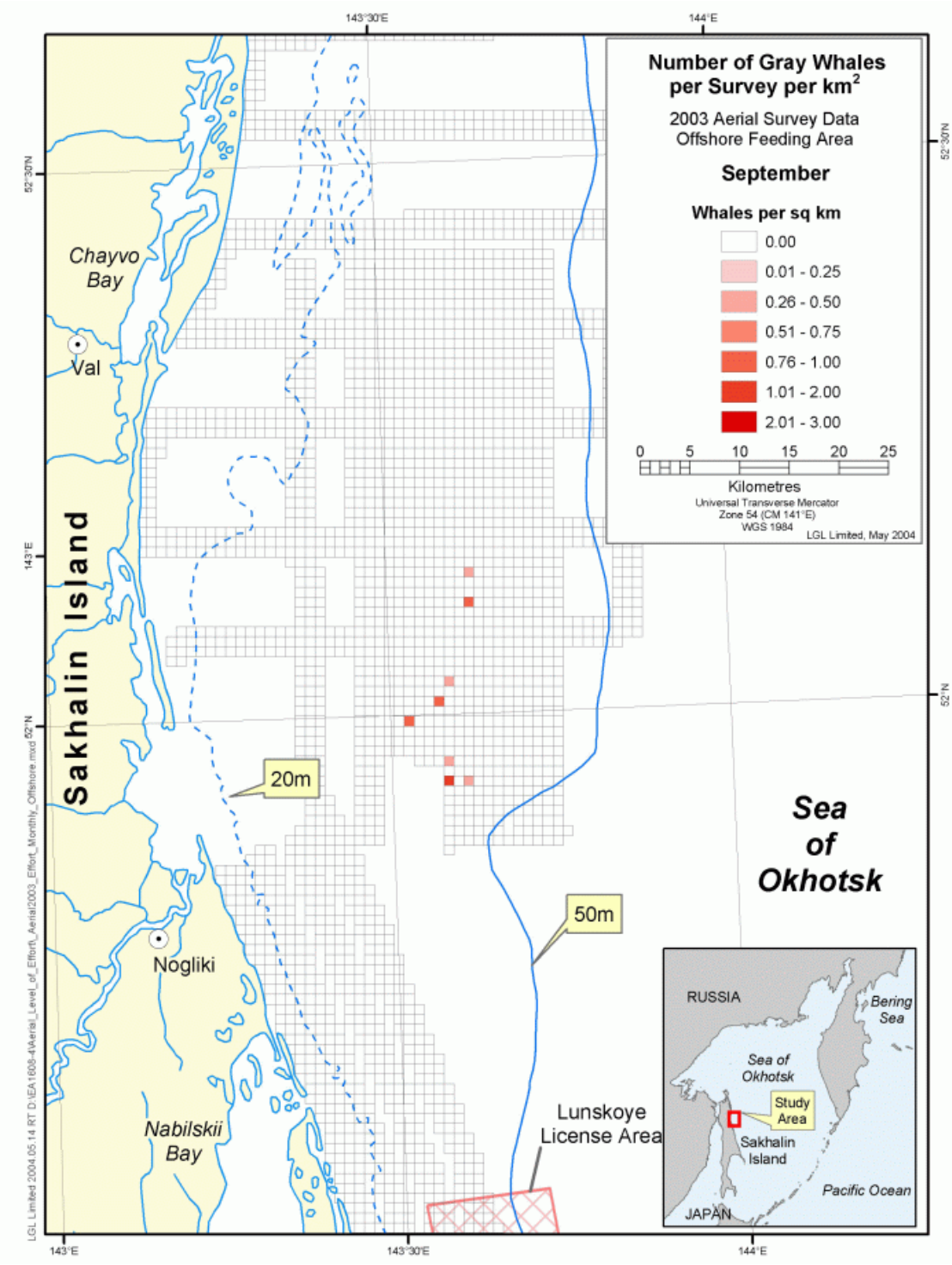


Figure 62. Relative density of gray whales in the Offshore area (number of whales seen per 1 km^2), September 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Offshore grid surveys, including partial ones, and an Extensive grid survey).

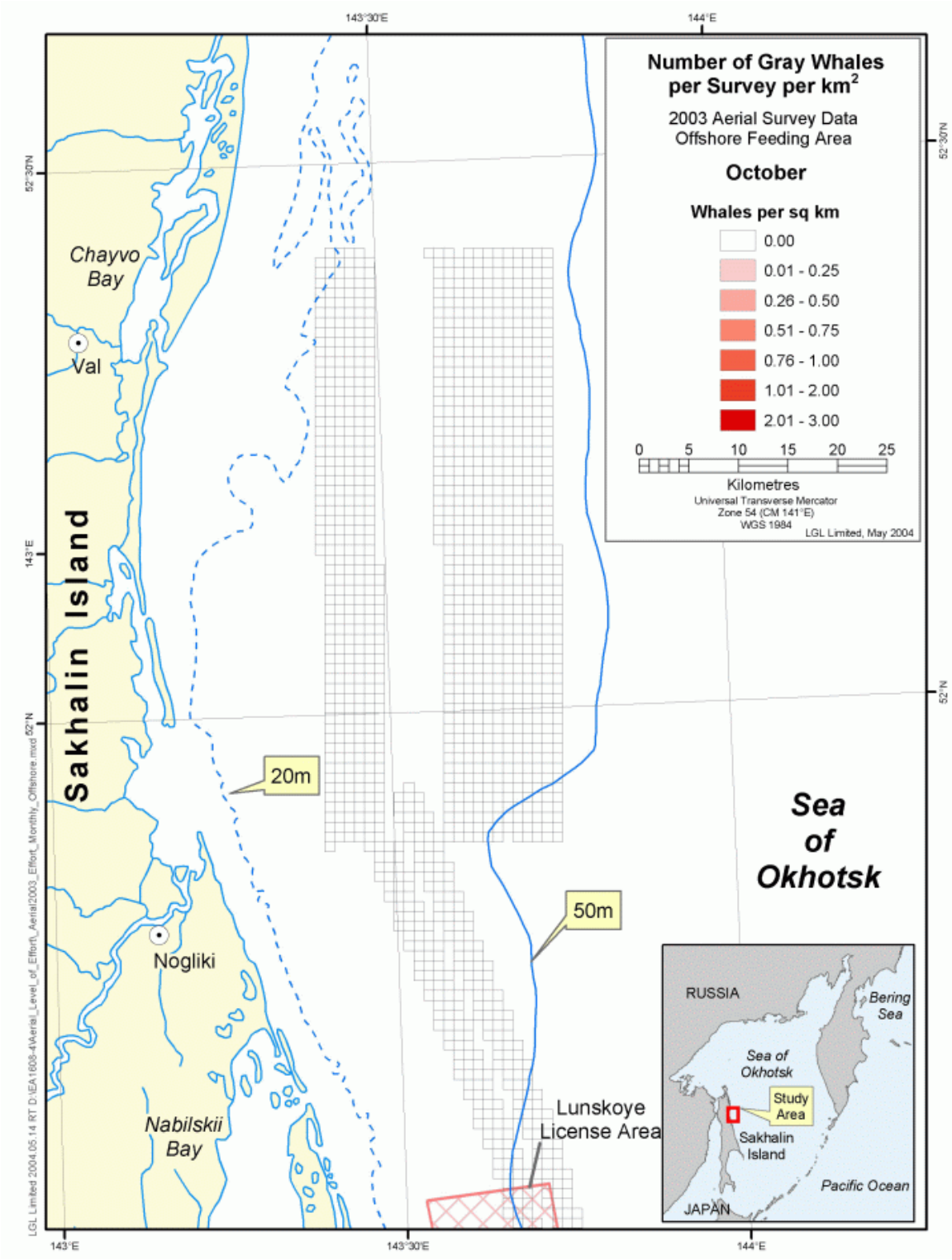


Figure 63. Relative density of gray whales in the Offshore area (number of whales seen per 1 km^2), October 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only, all Offshore grid surveys, including partial ones).

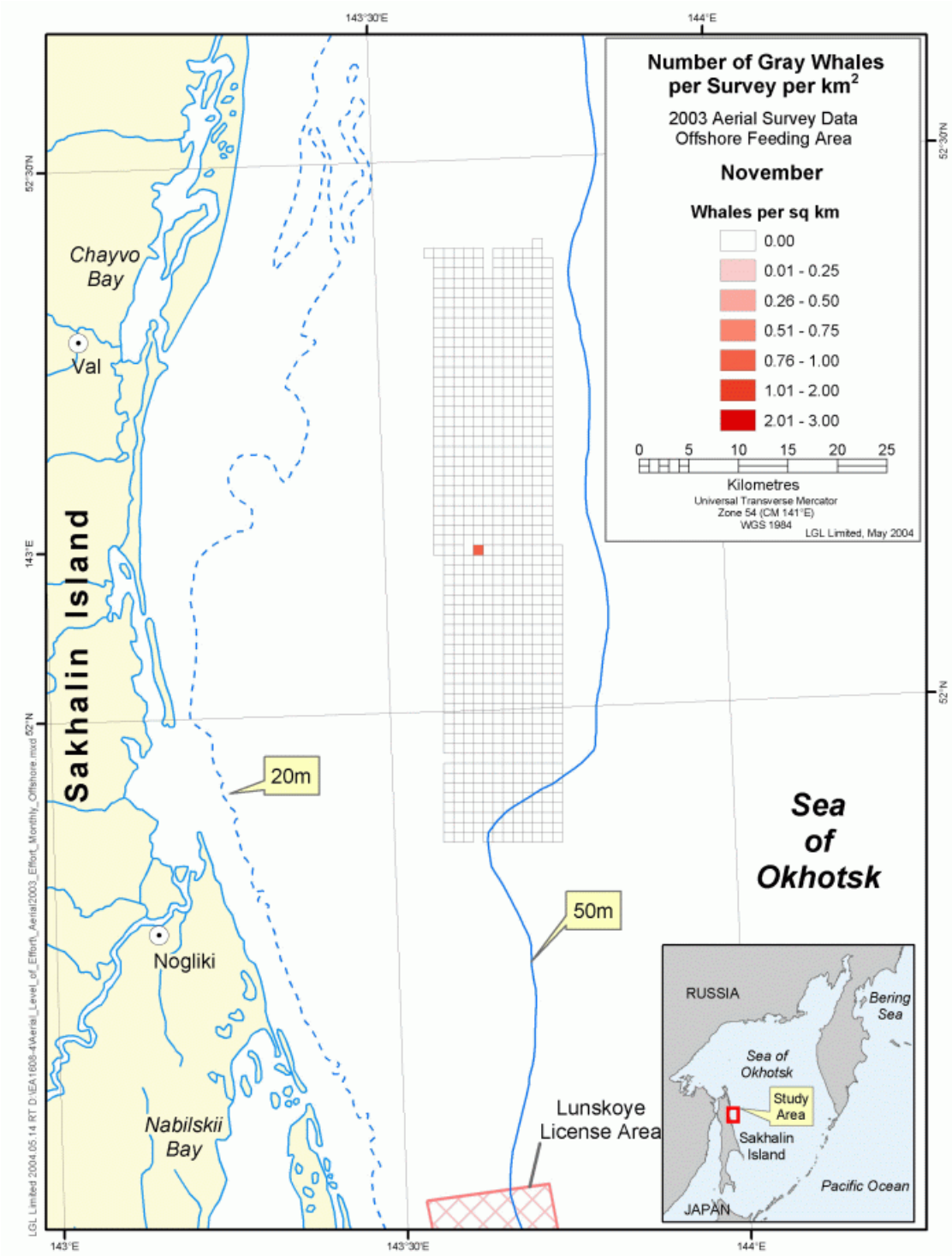


Figure 64. Relative density of gray whales in the Offshore area (number of whales seen per 1 km^2), November 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only).

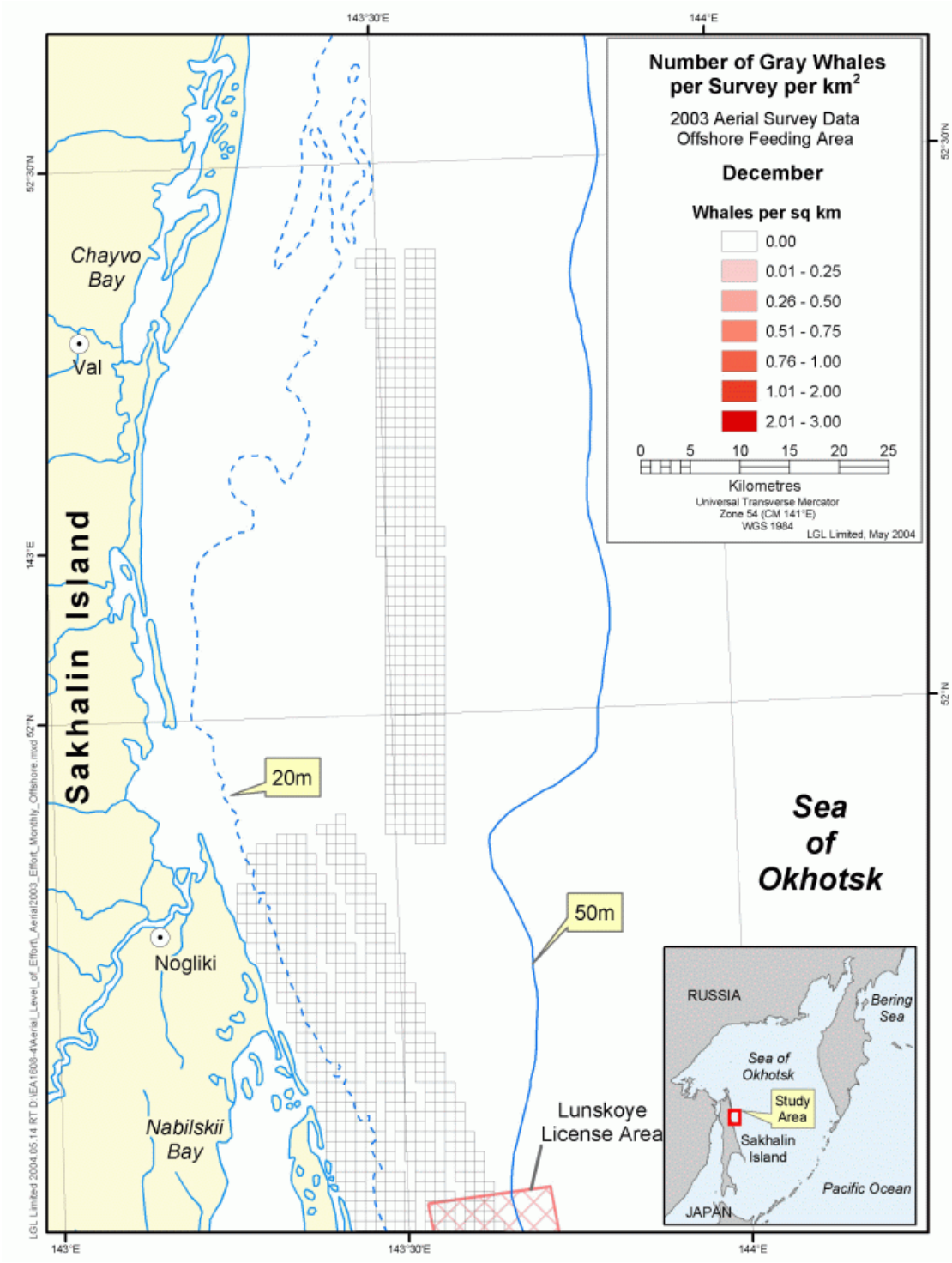


Figure 65. Relative density of gray whales in the Offshore area (number of whales seen per 1 km^2), December 2003. Numbers of gray whales are weighed by the survey effort (on-transect sightings only).

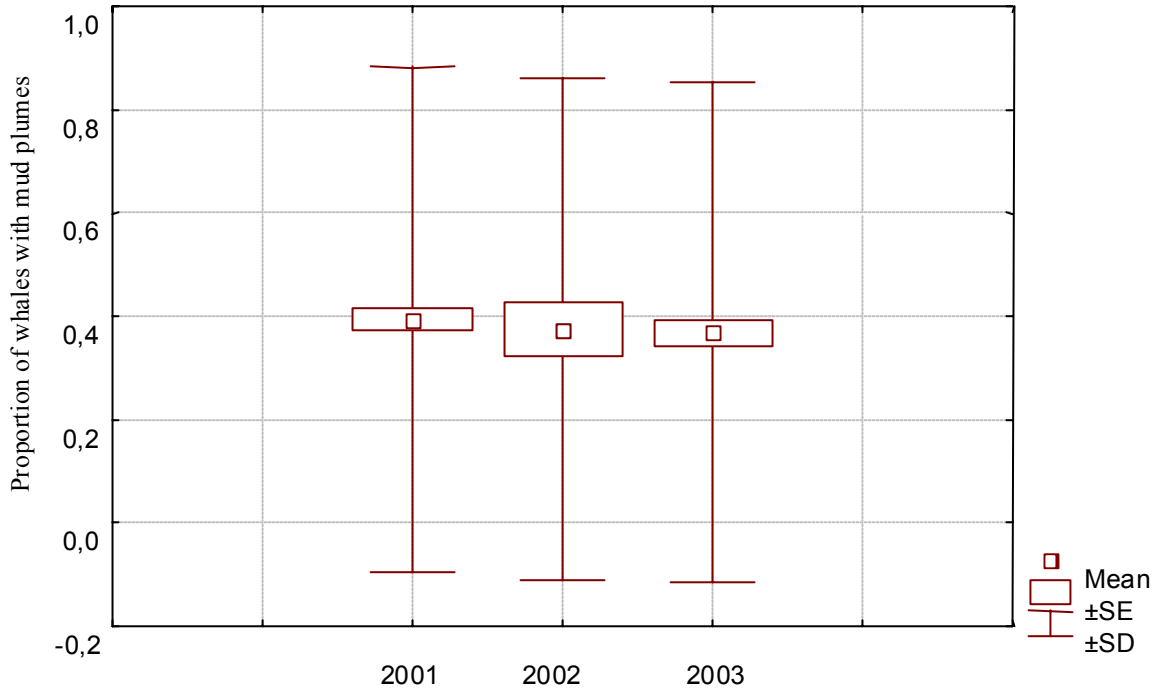
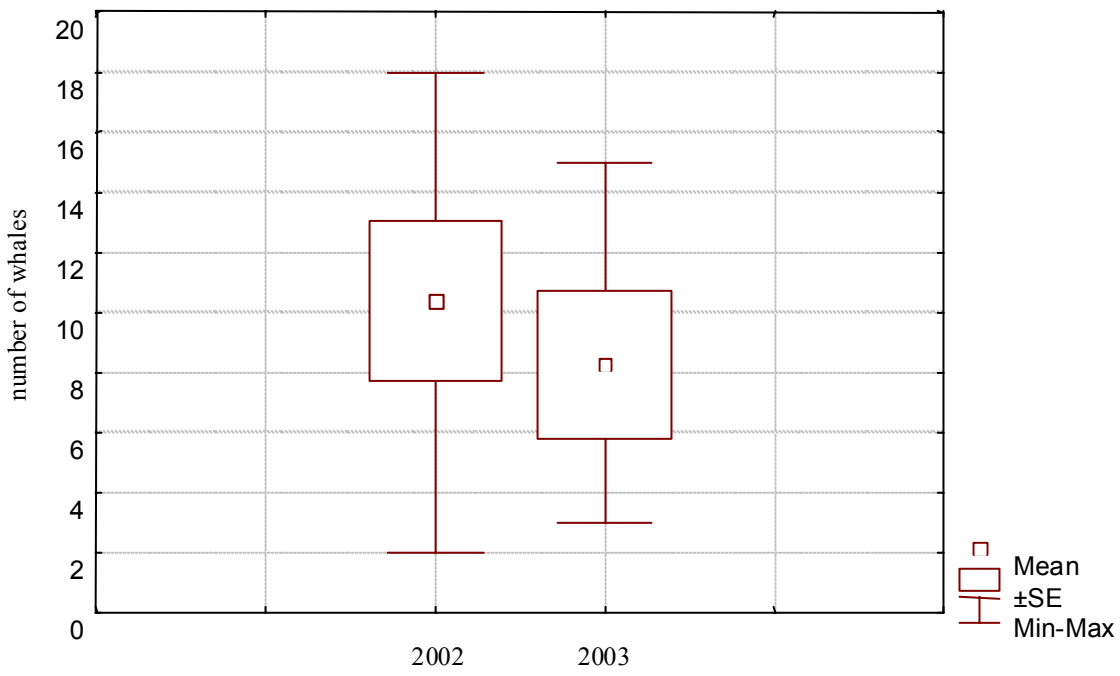


Figure 66. Gray whale feeding activity in the Piltun area in July-October 2001-2003 (Intensive surveys, on-transect sightings).



Group 1 vs. Group 2	T-test						
	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2
2002 vs. 2003	12,14	14,93	-1,02	19	0,32	7	14

Figure 67. Average number of gray whales sighted per survey in the Offshore area in July-September 2002 vs. 2003 (on-transect sightings, Offshore grid surveys).

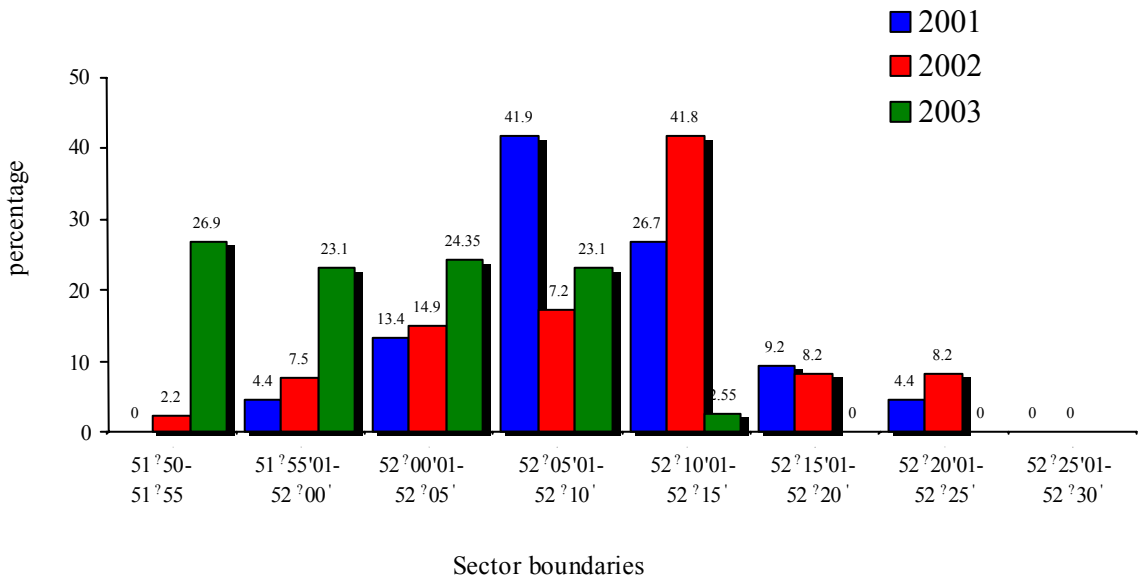


Figure 68. Latitudinal distribution of gray whales in the Offshore feeding area in 2001-2003 (all data, on- and off-transect sightings).

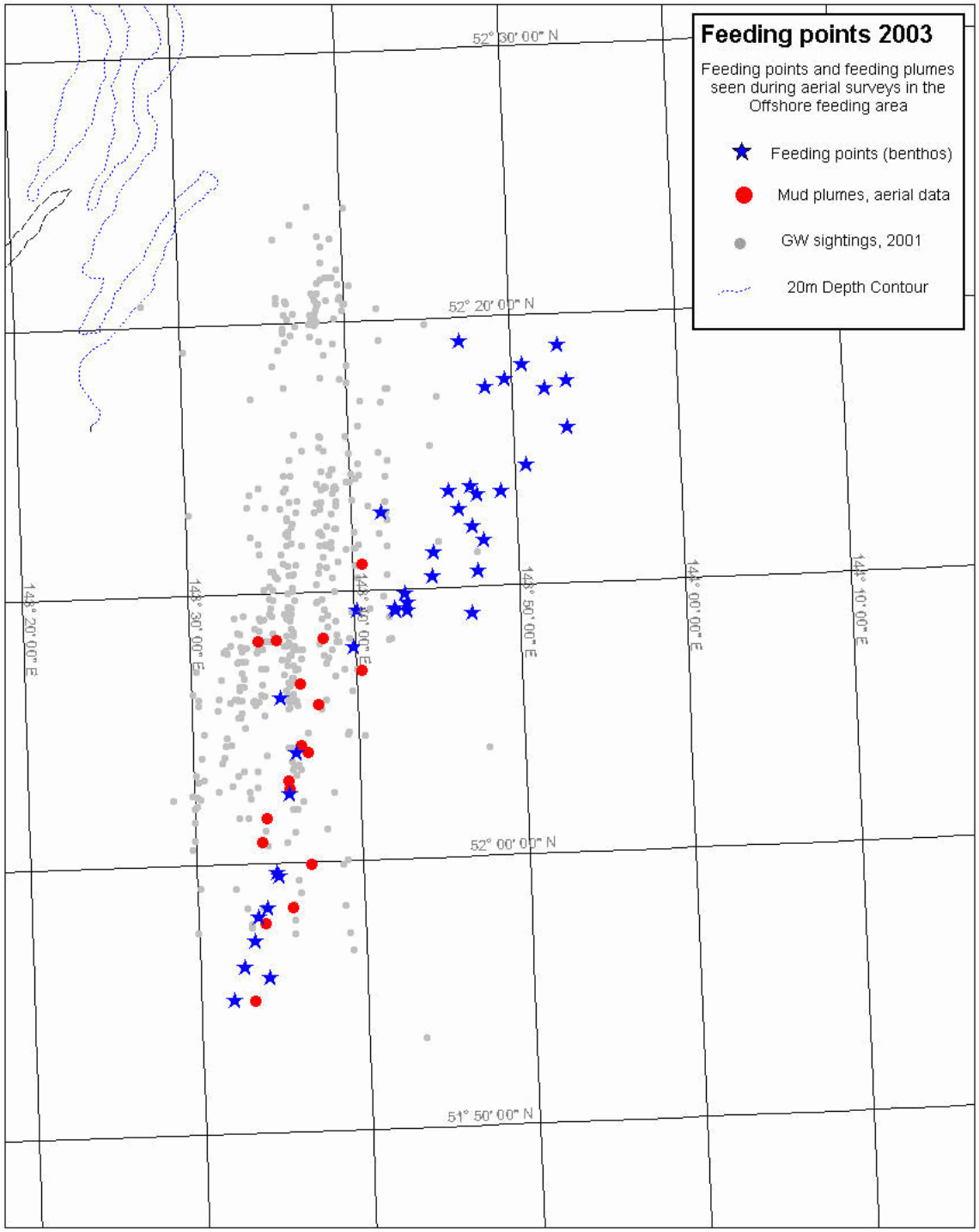
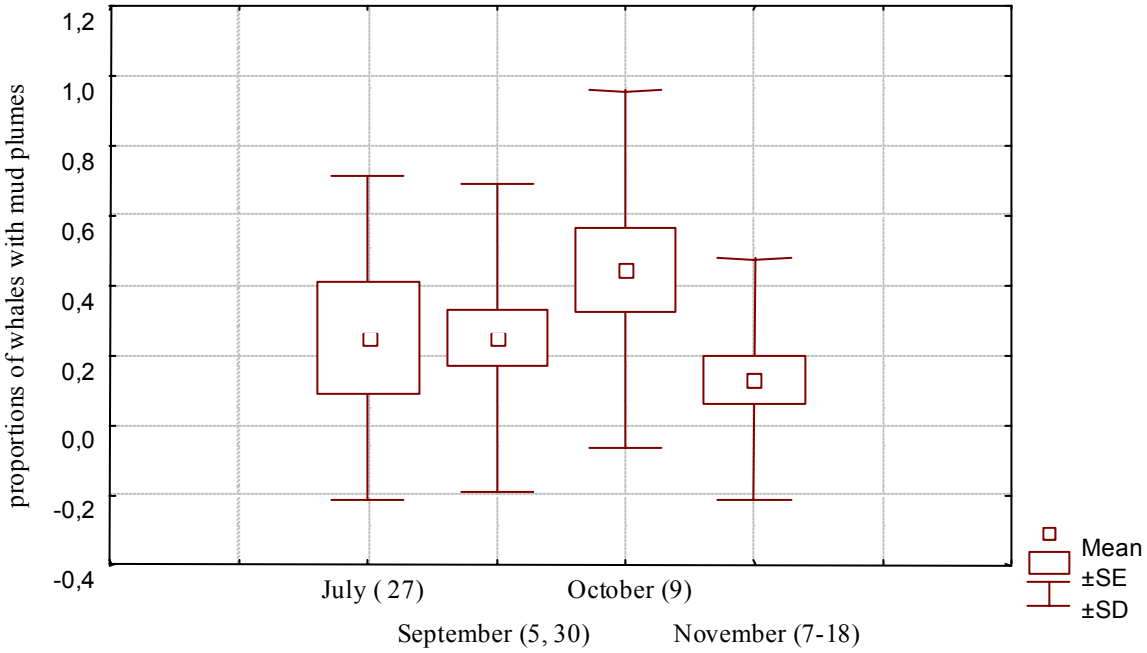
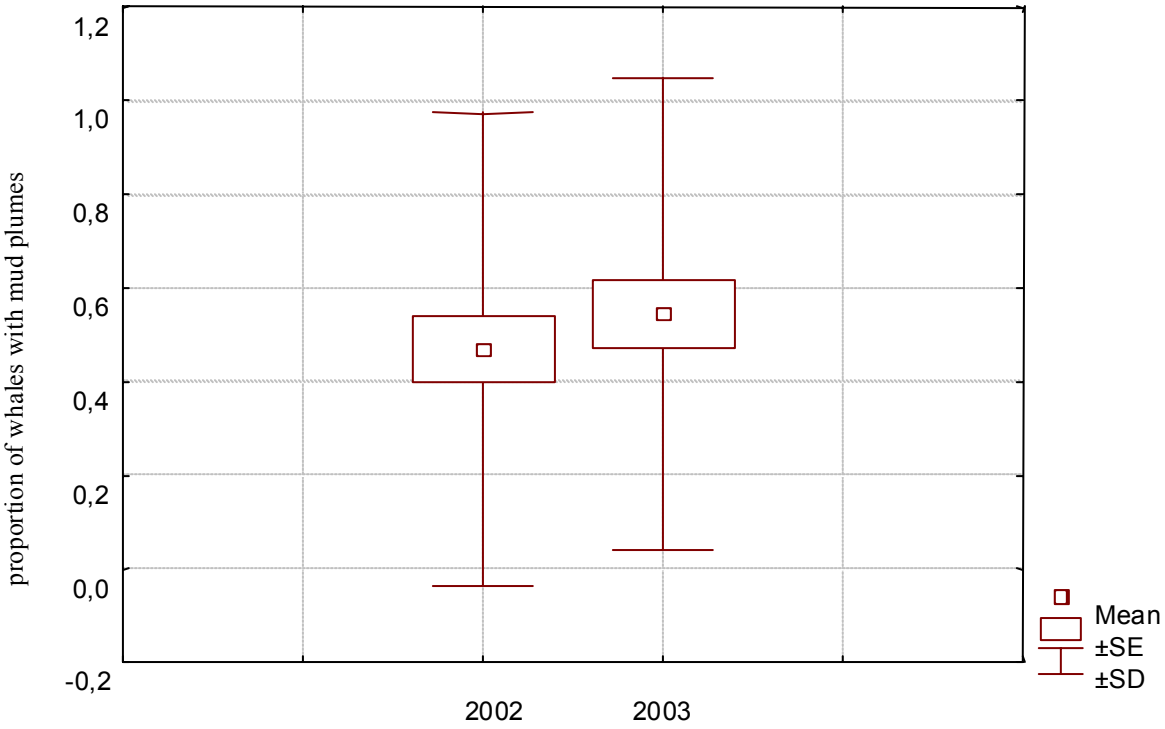


Figure 69. Locations of gray whales with feeding plumes (red circles) observed in the Offshore area on July – October 2003 aerial surveys with locations of benthic samples collected at whale feeding points (stars) in August – September 2003 by researchers onboard the Nevelskoy. Gray dots are 2001 aerial survey sightings of gray whales (Data on feeding points courtesy V.A. Fadeev).



Group 1 vs. Group 2	T-test						
	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2
July (27) vs. September (5, 30)	0,25	0,25	-0,00	34	1,00	8	28
July (27) vs. October (9)	0,25	0,44	-0,92	24	0,37	8	18
July (27) vs. November (7-18)	0,25	0,13	0,77	29	0,45	8	23

Figure 70. Gray whales feeding indices in the Offshore area in July – November 2002 (on-transect sightings).



Group 1 vs. Group 2	T-test						
	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2
2002 vs. 2003	0,47	0,55	-0,73	91	0,47	49	44

Figure 71. Gray whales feeding indices in the Offshore area in July – September: 2002 vs. 2003 (on-transect sightings).

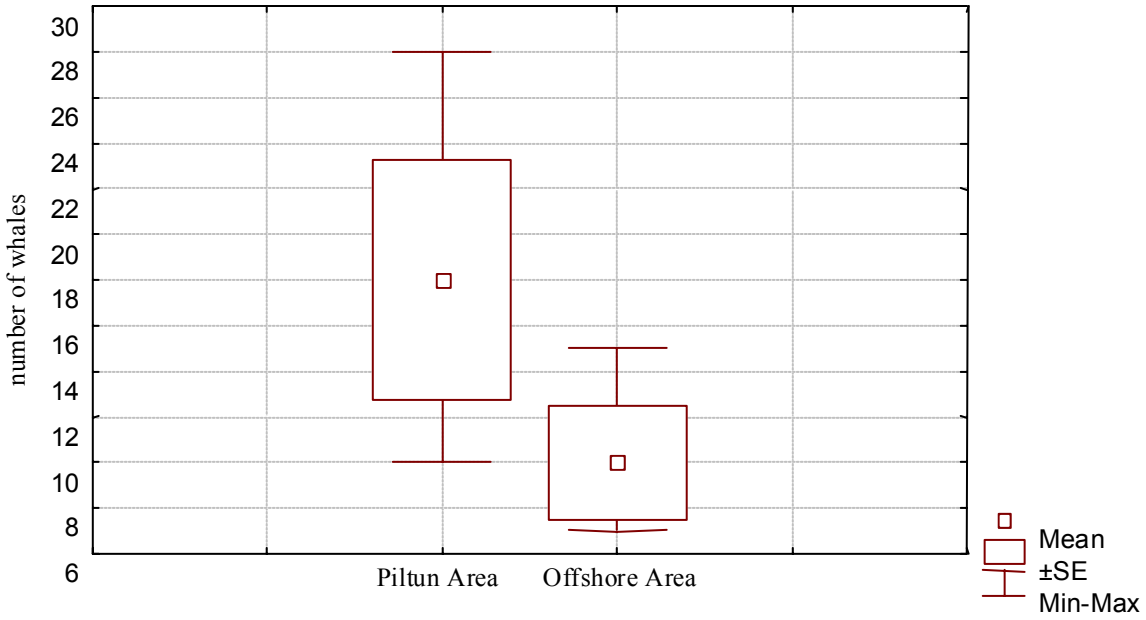
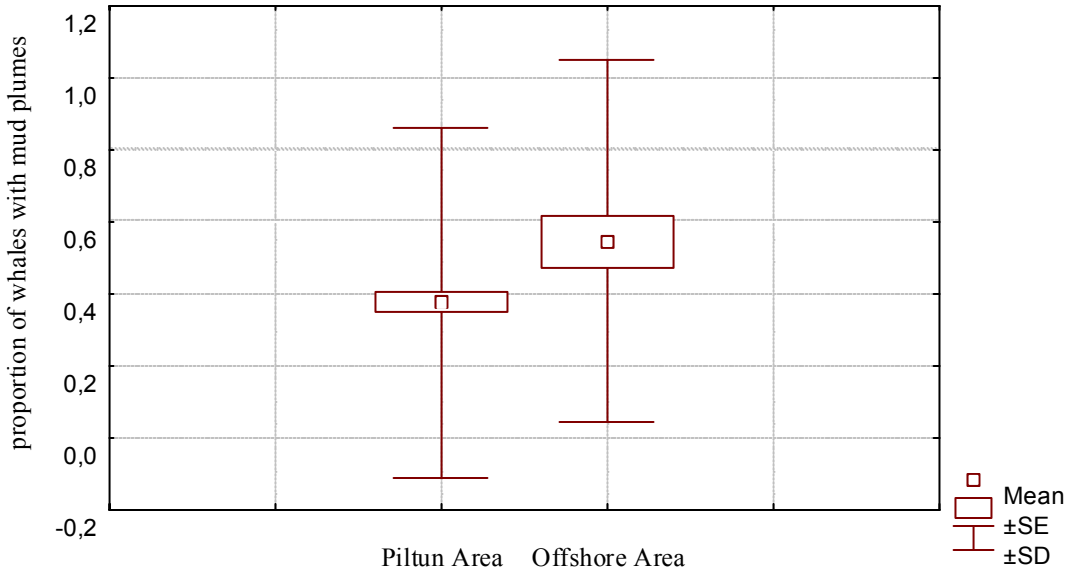


Figure 72. Mean number of observed gray whales in July-October 2003 in the Piltun and the Offshore areas (on-transect sightings, Piltun grid and Offshore grid, resp.).



Group 1 vs. Group 2	T-test						
	Mean Group 1	Mean Group 2	t-value	df	p	Valid N Group 1	Valid N Group 2
Piltun vs. Offshore	0,38	0,55	-2,13	300	0,03	258	44

Figure 73. Feeding activity of gray whales in July-October 2003 in the Piltun and the Offshore areas (on-transect sightings, Piltun grid and Offshore grid, resp.).

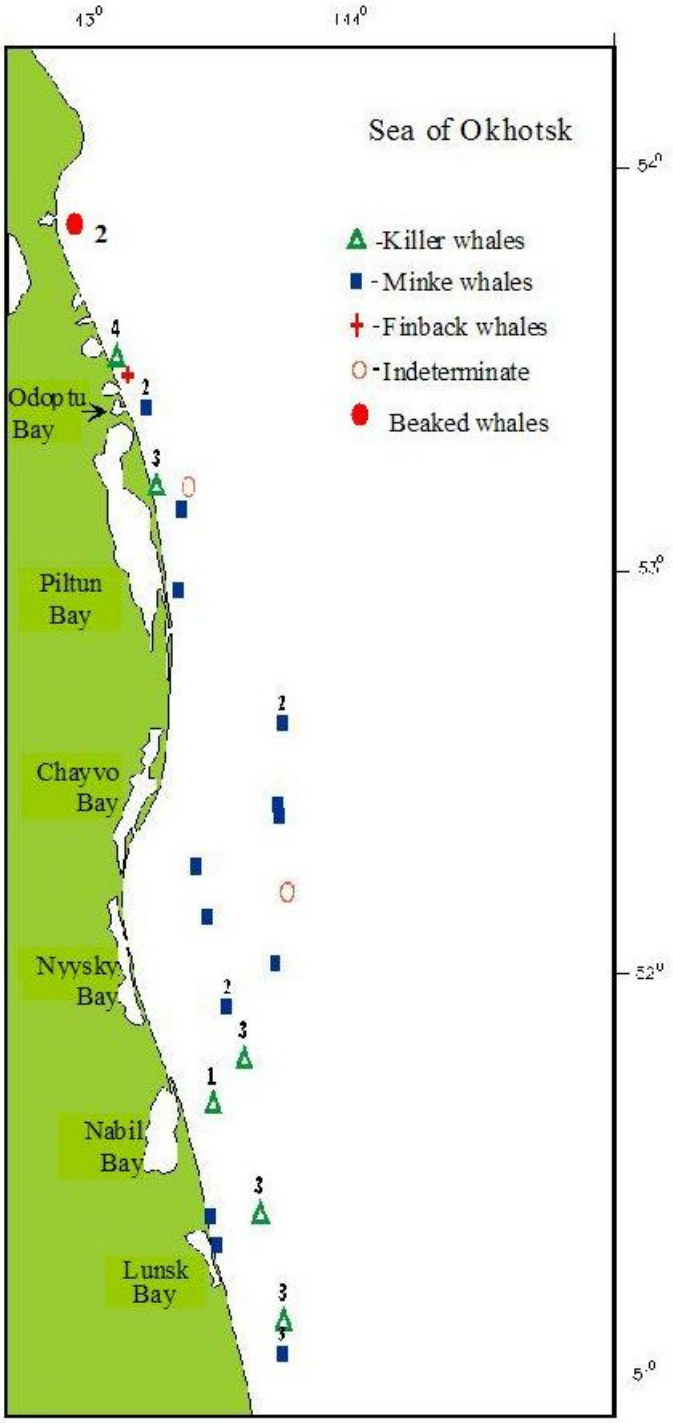


Figure 74. Other cetaceans observed on aerial surveys in June-December 2003. Number of whales if >1 are shown beside symbols (on- and off-transect sightings, all grids).

APPENDICES

APPENDIX 1

Sighting data of gray whales recorded during the 2003 aerial surveys in coastal areas of northeastern Sakhalin.

Sighting ID	Date	Survey Type	Altitude, m ASL	Line	On transect or off	Time	# of gray whales	Plumes	Offset, m	Latitude, digital degrees	Longitude, digital degrees	Orientation
1	6 June	Off	500	6	on	10:55:17	1	0	714	51.912986	143.612501	N
2	6 June	Off	500	5	off	11:32:37	1	2	0	51.914847	143.553908	S
3	6 June	Off	500	5	on	11:32:37	1	-999	1667	51.914847	143.578211	-999
4	7 June	Off	500	5	on	15:23:40	1	2	833	51.962328	143.567231	N
5	5 July	Int	300		off	11:38:22	1	1	1500	52.72014	143.35840	N
6	5 July	Int	300	2	on	12:41:44	3	3	857	52.87058	143.35497	S
7	5 July	Int	300	2	off	12:42:14	1	-999	1500	52.89113	143.34567	S
8	5 July	Int	300	2	on	12:43:40	2	2	600	52.93554	143.34719	-999
9	5 July	Int	300	2	on	12:45:07	2	-999	1000	52.98487	143.33084	SW
10	5 July	Int	300	2	on	12:51:40	3	3	1000	53.20484	143.28264	SW
11	5 July	Int	300	2	on	13:00:40	1	0	375	53.49268	143.15800	S
12	8 July	Int	300	2	on	9:20:40	1	1	750	53.18501	143.29306	-999
13	8 July	Int	300	2	on	9:23:19	1	1	1000	53.11804	143.30157	E
14	8 July	Int	300	2	on	9:25:08	1	0	857	53.07179	143.31558	N
15	8 July	Int	300	2	off	9:27:44	1	1	1200	53.00465	143.32506	NE
16	8 July	0ff	500	7	off	10:44:46	3	-999	2500	52.06435	143.60471	S
17	8 July	0ff	500	7	off	10:45:33	5	-999	5000	52.04172	143.56897	-999
18	8 July	0ff	500		off	10:52:59	1	-999	455	51.87575	143.59023	-999
19	8 July	0ff	500	6	on	10:57:07	2	0	909	51.99856	143.61479	S
20	8 July	0ff	500	6	on	10:57:07	0	1	909	51.99856	143.61479	-999
21	8 July	0ff	500	6	on	10:58:58	3	1	455	52.04991	143.59455	-999
22	8 July	0ff	500	6	on	10:59:26	3	3	1000	52.06733	143.61566	S
23	8 July	0ff	500	6	on	10:59:26	0	1	1000	52.06733	143.61566	-999
24	8 July	Int	300	1	on	12:50:54	1	1	333	53.02327	143.31805	N
25	8 July	Int	300	1	on	13:00:42	1	-999	857	53.32552	143.23275	E
26	8 July	Int	300	1	on	13:01:09	2	1	600	53.33612	143.22398	S
27	8 July	Int	300	1	on	13:02:49	1	1	300	53.38614	143.19171	W
28	8 July	Ext	500	29	on	16:06:29	1	1	1250	53.46750	143.13680	S
29	8 July	Ext	500	27	on	16:39:16	2	1	1250	53.33019	143.23359	S
30	8 July	Ext	500	27	on	16:39:23	1	0	1250	53.32994	143.22674	S
31	9 July	Ext	500	26	on	9:31:39	2	2	714	53.25545	143.26583	SE
32	9 July	Ext	500	26	on	9:31:56	1	0	500	53.25342	143.28122	SW
33	9 July	Ext	500	24	on	10:05:17	1	0	1250	53.08370	143.32589	W
34	9 July	Ext	500	24	on	10:05:17	1	0	1000	53.08145	143.32589	SE
35	9 July	Ext	500	23	on	10:33:09	1	1	625	52.97615	143.33166	N
36	9 July	Ext	500	23	on	10:33:09	1	1	625	52.97615	143.33166	S
37	9 July	Ext	500	23	on	10:33:09	0	1	625	52.97615	143.33166	-999
38	9 July	Int	300	2	on	13:04:37	1	1	750	52.97130	143.33545	E
39	9 July	Int	300	2	on	13:09:40	2	0	750	53.14325	143.29952	N
40	9 July	Int	300	2	on	13:12:00	2	0	1000	53.22298	143.27872	S
41	9 July	Int	300	2	on	13:21:45	3	0	1000	53.24815	143.26837	S,N,W
42	9 July	Int	300	2	off	13:13:11	2	-999	1200	53.26237	143.26013	S
43	9 July	Int	300	2	on	13:20:39	1	0	1000	53.51206	143.12533	-999
44	9 July	Int	300	1	on	14:24:50	0	2	429	53.39498	143.18722	-999
45	9 July	Int	300	1	on	14:25:42	0	1	750	53.37129	143.20771	-999
46	9 July	Int	300	1	on	14:27:33	1	1	375	53.33419	143.22124	S
47	9 July	Int	300	1	on	14:31:48	1	0	1000	53.23990	143.27135	S
48	9 July	Int	300	1	off	14:35:47	1	1	1200	53.14820	143.30011	E
49	9 July	Int	300	1	off	14:36:19	1	1	1500	53.13513	143.30823	S
50	9 July	Ext	500	13	off	15:34:06	1	-999	2500	52.09367	143.62036	-999

Sighting ID	Date	Survey Type	Altitude, m ASL	Line	On transect or off	Time	# of gray whales	Plumes	Offset, m	Latitude, digital degrees	Longitude, digital degrees	Orientation
51	9 July	Int	300	1	off	16:43:39	2	-999	1200	52.91091	143.34810	S
52	9 July	Int	300	1	off	16:50:30	1	0	1200	53.23773	143.27473	W
53	9 July	Int	300	1	on	16:50:30	1	0	1000	53.23774	143.27174	S
54	10 July	Int	300	2	off	9:18:30	1	-999	3000	53.35562	143.18986	-999
55	10 July	Int	300	2	on	9:29:35	1	1	375	53.09356	143.31791	S
56	10 July	Int	300	2	on	9:30:08	1	0	500	53.07741	143.33622	S
57	10 July	Int	300	2	off	9:31:31	1	0	1500	53.04573	143.31063	N
58	10 July	Int	300	2	on	9:41:33	2	0	750	52.79977	143.38057	S
59	15 July	Int	300	2	on	9:15:03	1	0	1000	53.41386	143.18508	S
60	15 July	Int	300	2	on	9:22:41	1	0	750	53.20905	143.28354	S
61	15 July	Int	300	2	on	9:26:20	1	0	750	53.10260	143.30953	S
62	15 July	Int	300	2	on	9:26:58	1	0	429	53.08564	143.31935	N
63	15 July	Int	300	2	off	9:30:35	1	-999	1500	52.98176	143.32285	-999
64	15 July	Int	300	2	on	9:32:36	1	0	250	52.92791	143.35554	N
65	15 July	Int	300	2	on	9:33:20	1	0	500	52.90490	143.35529	N
66	15 July	Int	300	2	on	9:34:16	5	0	333	52.87910	143.36200	N
67	15 July	Int	300	2	on	9:34:49	1	-999	750	52.71905	143.38100	NE
68	15 July	Off	500	7	on	10:02:35	1	1	417	52.13757	143.63495	S
69	15 July	Off	500	7	off	10:11:17	1	0	2000	51.88162	143.61222	W
70	15 July	Off	500	6	on	12:19:56	3	3	417	52.04503	143.59609	N
71	15 July	Off	500	6	on	12:20:55	0	1	556	52.07180	143.60930	-999
72	15 July	Off	500	6	on	12:22:40	1	-999	1000	52.12057	143.58688	N
73	15 July	Int	300		off	12:42:19	1	0	500	52.67494	143.36204	SE
74	15 July	Int	300	1	off	12:43:56	2	-999	3000	52.73002	143.38183	S
75	15 July	Int	300	1	off	12:55:41	3	-999	1500	53.05717	143.32473	-999
76	15 July	Int	300	1	on	12:59:39	2	0	857	53.16225	143.26329	-999
77	15 July	Int	300	1	on	13:04:04	1	1	600	53.28466	143.24788	N
78	15 July	Int	300	1	on	14:16:02	1	1	500	53.45166	143.15155	E
79	15 July	Int	300	1	on	14:28:28	1	1	750	53.12754	143.27560	S
80	15 July	Int	300	1	on	14:34:40	2	2	1000	52.95849	143.33960	SE
81	15 July	Int	300	1	off	14:37:50	1	-999	3000	52.87050	143.38367	SE
82	15 July	Off	500	5	on	15:06:59	1	0	1429	52.05581	143.53519	S
83	15 July	Int	300	2	on	16:38:11	1	1	429	52.76723	143.36027	SE
84	15 July	Int	300	2	on	16:40:44	1	0	375	52.83921	143.36939	E
85	15 July	Int	300	2	on	16:45:12	1	1	600	52.96172	143.34051	N
86	15 July	Int	300	2	on	16:45:40	1	1	500	52.97573	143.33906	N
87	15 July	Int	300	2	on	16:51:23	2	2	1000	53.13598	143.29744	S
88	15 July	Int	300	2	on	16:53:55	1	1	333	53.20716	143.29069	N
89	15 July	Int	300	2	off	16:54:58	1	-999	1500	53.23904	143.26396	N
90	15 July	Int	300	2	off	17:01:07	1	0	0	53.41139	143.20527	S
91	18 August	Int	300	1	on	10:29:56	1	0	750	52.97604	143.33595	S
92	18 August	Int	300	1	on	10:30:57	2	1	667	52.95194	143.33976	S
93	18 August	Int	300	1	on	10:31:26	1	0	600	52.94054	143.34145	-999
94	18 August	Int	300	1	on	10:33:41	1	0	500	52.89011	143.35269	-999
95	18 August	Int	300	1	on	10:37:01	1	0	600	52.81605	143.33585	S
96	18 August	Int	300	1	on	10:37:01	0	1	600	52.81605	143.33585	-999
97	18 August	Int	300		off	11:01:16	3	0	1000	53.27704	143.31161	S
98	19 August	Int	300		off	10:41:59	1	0	600	53.24591	143.30129	SE
99	19 August	Int	300		off	10:48:14	1	0	1000	53.10098	143.31294	S
100	19 August	Int	300		off	10:48:14	0	1	600	53.10098	143.31893	S
101	19 August	Int	300		off	10:51:47	1	0	600	53.01810	143.33631	S
102	19 August	Int	300		off	10:52:04	1	0	600	53.01124	143.33867	S
103	19 August	Int	300		off	10:56:36	1	0	500	52.90428	143.37306	E
104	19 August	Int	300		off	14:12:18	1	0	1500	52.84635	143.36565	S
105	19 August	Int	300		off	14:13:02	2	2	857	52.86853	143.32683	S
106	19 August	Int	300		off	14:13:02	1	1	300	52.86853	143.33513	-999
107	19 August	Int	300	1	on	14:14:19	1	0	3000	52.90765	143.38034	S

Sighting ID	Date	Survey Type	Altitude, m ASL	Line	On transect or off	Time	# of gray whales	Plumes	Offset, m	Latitude, digital degrees	Longitude, digital degrees	Orientation
108	19 August	Int	300	1	on	14:14:30	1	1	462	52.91398	143.32791	S
109	19 August	Int	300	1	on	14:17:36	1	0	600	53.00579	143.31285	S
110	19 August	Int	300	1	on	14:27:55	1	1	1000	53.01512	143.30510	S
111	19 August	Int	300	1	on	15:45:06	1	-999	750	53.08687	143.28406	S
112	19 August	Int	300	1	on	15:48:44	1	1	500	53.00222	143.30994	S
113	19 August	Int	300	1	on	15:48:44	1	-999	1500	53.00222	143.29499	S
114	19 August	Int	300		off	15:53:59	2	-999	1000	52.87567	143.32987	SE
115	19 August	Int	300		off	15:53:59	1	1	429	52.87567	143.33839	N
116	19 August	Int	300		off	15:54:50	1	0	250	52.85569	143.34652	NW
117	19 August	Int	300		off	15:55:30	3	0	429	52.84211	143.36066	SE
118	19 August	Int	300		off	15:55:55	2	0	1000	52.83045	143.34169	SE
119	19 August	Int	300	2	on	18:04:12	1	-999	600	52.83560	143.37675	S
120	19 August	Int	300	2	on	18:15:28	1	0	750	53.19633	143.29845	S
121	19 August	Int	300		off	18:16:23	3	0	1000	53.22270	143.28425	S
122	19 August	Int	300		off	18:15:39	2	0	1000	53.23041	143.28080	S
123	20 August	Int	300	2	off	9:35:29	1	0	1500	53.29446	143.24678	N
124	20 August	Int	300	2	off	9:39:10	2	-999	3000	53.20293	143.25486	-999
125	20 August	Int	300	2	on	9:50:43	1	0	1000	52.92343	143.34859	S
126	20 August	Int	300	2	on	9:51:42	1	1	750	52.90225	143.35805	S
127	20 August	Int	300	2	on	9:52:05	1	1	1000	52.89420	143.35558	S
128	20 August	Int	300	2	on	9:53:13	0	1	750	52.86699	143.36192	-999
129	20 August	Int	300	2	on	9:53:49	2	2	1000	52.85390	143.35738	S
130	20 August	Off	500	8	on	10:46:16	0	1	1250	52.11666	143.67200	-999
131	20 August	Off	500	8	on	10:48:49	0	1	833	52.18246	143.67659	-999
132	20 August	Off	500	6	on	11:31:10	2	2	556	52.10970	143.60994	S
133	20 August	Off	500	6	on	11:32:04	0	1	1000	52.13756	143.58729	-999
134	20 August	Off	500	5	on	11:54:59	3	0	714	52.15107	143.57209	-999
135	20 August	Off	500	5	on	11:55:38	0	1	556	52.13670	143.56940	-999
136	20 August	Off	500	5	on	11:55:53	3	0	1667	52.13211	143.53672	-999
137	20 August	Off	500	5	off	11:57:33	1	-999	2500	52.09074	143.52488	E
138	20 August	Off	500	5	on	12:00:05	0	2	833	52.02756	143.57205	-999
139	20 August	Off	500	3	on	12:38:06	1	0	1000	52.16671	143.45489	S
140	20 August	Int	300	1	on	13:19:00	1	0	1000	52.84390	143.35850	S
141	20 August	Int	300	1	on	13:19:27	2	1	750	52.85850	143.35300	S
142	20 August	Int	300	1	on	13:20:10	1	1	462	52.87776	143.33078	S
143	20 August	Int	300	1	on	13:20:59	1	0	600	52.90363	143.32531	N
144	20 August	Int	300	1	on	13:21:00	1	1	750	52.90693	143.34524	S
145	20 August	Int	300	1	on	13:21:30	4	4	750	52.91752	143.34355	-999
146	20 August	Int	300	1	off	13:21:30	1	0	1500	52.91752	143.35474	S
147	20 August	Int	300	1	on	13:21:56	2	2	1000	52.93505	143.34225	S
148	20 August	Int	300	1	on	13:25:39	1	1	500	53.05946	143.29433	S
149	20 August	Int	300	1	on	13:26:02	1	1	750	53.07255	143.28599	N
150	20 August	Int	300	1	on	13:28:26	1	1	375	53.15077	143.28753	S
151	20 August	Int	300	1	off	13:30:22	1	0	1500	53.21776	143.28617	S
152	20 August	Int	300	1	on	13:30:57	2	0	333	53.23628	143.26318	NW
153	20 August	Int	300	1	on	13:33:33	0	1	750	53.31927	143.23514	-999
154	20 August	Int	300	1	off	15:13:35	1	-999	1500	52.81600	143.36557	N
155	20 August	Int	300	1	on	15:14:35	2	2	300	52.83596	143.34893	NW
156	20 August	Int	300	1	on	15:15:13	2	0	1000	52.85445	143.35840	N
157	20 August	Int	300	1	off	15:15:32	1	-999	1500	52.86357	143.36409	S
158	20 August	Int	300	1	on	15:15:40	2	2	429	52.86800	143.33467	N, S
159	20 August	Int	300	1	off	15:15:50	1	-999	3000	52.87175	143.38522	S
160	20 August	Int	300	1	on	15:16:06	1	0	1000	52.88044	143.35436	S
161	20 August	Int	300	1	on	15:16:20	1	0	1000	52.88595	143.35353	S
162	20 August	Int	300	1	on	15:16:55	1	1	1000	52.90162	143.34892	S
163	20 August	Int	300	1	off	15:17:50	3	-999	3000	52.93124	143.37648	S
164	20 August	Int	300	1	on	15:18:30	1	0	750	52.95143	143.31644	S

Sighting ID	Date	Survey Type	Altitude, m ASL	Line	On transect or off	Time	# of gray whales	Plumes	Offset, m	Latitude, digital degrees	Longitude, digital degrees	Orientation
165	20 August	Int	300	1	off	15:19:19	1	-999	1500	52.97512	143.34389	S
166	20 August	Int	300	1	on	15:19:50	1	0	1000	52.99226	143.33434	S
167	20 August	Int	300	1	on	15:20:40	1	-999	1000	53.01482	143.29881	SE
168	20 August	Int	300	1	on	15:25:51	1	0	300	53.16256	143.28790	S
169	20 August	Int	300	1	on	15:26:30	1	0	250	53.17595	143.28202	S
170	20 August	Int	300	1	on	15:31:25	2	2	1000	53.31400	143.23823	E
171	20 August	Int	300	3	off	15:52:40	1	-999	3000	53.23537	143.27557	S
172	20 August	Int	300	2	on	16:17:02	1	1	1000	52.82102	143.37927	SE
173	20 August	Int	300	2	on	16:17:36	1	0	429	52.83792	143.35870	NW
174	20 August	Int	300	2	off	16:18:15	1	-999	3000	52.87478	143.32188	S
175	20 August	Int	300	2	on	16:18:15	1	1	500	52.87478	143.35914	S
176	20 August	Int	300	2	off	16:19:46	1	-999	3000	52.90303	143.31974	S
177	20 August	Int	300	2	on	16:24:54	1	-999	750	53.05227	143.32142	-999
178	20 August	Int	300	2	on	16:28:07	2	0	333	53.14332	143.31919	S
179	20 August	Int	300	2	off	16:29:45	1	-999	3000	53.19091	143.25647	-999
180	20 August	Int	300	2	on	16:30:29	1	0	375	53.21137	143.30315	S
181	20 August	Int	300	2	off	16:32:09	1	-999	3000	53.25907	143.32459	S
182	20 August	Int	300	2	on	16:35:00	4	-999	1000	53.33535	143.23105	NW
183	18 September	Int	300	2	off	10:10:05	1	-999	3000	53.479385	143.206955	N
184	18 September	Int	300	2	off	10:18:25	2	-999	1500	53.280258	143.247613	S
185	18 September	Int	300	2	off	10:18:55	3	-999	1500	53.268360	143.252019	-999
186	18 September	Int	300	2	off	10:22:45	1	0	1200	53.174751	143.287984	N
187	18 September	Int	300	2	on	10:38:23	2	2	500	52.788953	143.375564	E
188	18 September	Int	300	2	on	10:38:23	2	2	600	52.788953	143.377051	-999
189	18 September	Int	300	2	on	10:39:17	1	-999	231	52.768332	143.374916	S
190	18 September	Off	500	6	on	12:05:34	1	-999	1250	51.954351	143.582110	SE
191	18 September	Off	500	6	on	12:06:11	0	3	455	51.971480	143.595031	-999
192	18 September	Off	500	6	on	12:10:41	2	2	1667	52.097088	143.627287	S
193	18 September	Off	500	5	on	12:39:55	1	1	714	52.013006	143.567157	W
194	18 September	Off	500	5	on	12:40:40	1	0	1667	51.996011	143.532855	W
195	18 September	Int	300	1	off	14:00:01	1	-999	3000	52.855353	143.381449	S
196	18 September	Int	300	1	on	14:01:23	2	2	1000	52.891263	143.350323	W
197	18 September	Int	300	1	on	14:01:23	1	1	273	52.891263	143.331349	-999
198	18 September	Int	300	1	on	14:03:03	1	-999	1000	52.939070	143.311602	-999
199	18 September	Int	300	1	on	14:09:46	1	1	333	53.124744	143.283636	NW
200	18 September	Int	300	1	off	14:11:06	2	-999	2000	53.162718	143.307940	S
201	18 September	Int	300	1	on	14:15:19	1	0	600	53.274073	143.248524	SE
202	18 September	Int	300	1	on	14:18:04	1	0	750	53.348140	143.220829	S
203	18 September	Int	300	1	on	14:18:30	1	1	600	53.358745	143.213249	S
204	18 September	Int	300	4	on	15:36:05	2	0	600	53.384044	143.272305	S
205	18 September	Int	300	2	on	16:07:53	1	0	333	52.769147	143.365720	N
206	18 September	Int	300	2	on	16:16:44	1	-999	500	53.021779	143.332418	W
207	18 September	Int	300	2	on	16:22:30	1	0	375	53.180260	143.296217	SW
208	18 September	Int	300	2	on	16:25:06	1	0	300	53.252068	143.275003	W
209	18 September	Int	300	2	on	16:26:19	2	-999	1000	53.285472	143.249533	N
210	18 September	Int	300	2	on	16:27:53	1	0	429	53.327948	143.240920	SE
211	18 September	Int	300	3	on	16:39:00	1	0	500	53.459859	143.210387	SW
212	18 September	Int	300	1	off	17:17:31	1	-999	1500	52.865986	143.359910	S
213	18 September	Int	300	1	on	17:19:12	1	1	750	52.911438	143.344498	S
214	18 September	Int	300	1	on	17:31:22	1	-999	1000	53.232397	143.243806	S
215	18 September	Int	300	1	off	17:32:38	1	-999	2000	53.264406	143.273593	S
216	18 September	Int	300	1	off	17:33:29	1	0	1500	53.284834	143.258574	NE
217	18 September	Int	300	1	on	17:34:49	2	0	375	53.319612	143.227030	NE
218	18 September	Int	300	1	on	17:35:39	2	0	333	53.340973	143.216948	E
219	19 September	Int	200	2	on	9:36:14	1	0	500	53.503026	143.146612	S
220	19 September	Int	200	2	on	9:42:37	1	0	400	53.347362	143.245344	W
221	19 September	Int	200	2	off	9:46:19	1	0	800	53.257315	143.265789	N

Sighting ID	Date	Survey Type	Altitude, m ASL	Line	On transect or off	Time	# of gray whales	Plumes	Offset, m	Latitude, digital degrees	Longitude, digital degrees	Orientation
222	19 September	Int	200	2	on	9:49:38	1	0	500	53.175936	143.300006	W
223	19 September	Int	200	2	on	9:49:49	1	0	400	53.172128	143.314381	-999
224	19 September	Int	200	2	on	9:58:54	1	0	400	52.949123	143.348879	N
225	19 September	Int	300	2	on	10:06:25	2	0	333	52.766899	143.376746	-999
226	19 September	Off	500	6	on	10:32:01	1	0	1000	52.127718	143.616512	-999
227	19 September	Off	500	6	off	10:36:43	1	0	5000	52.011546	143.675420	-999
228	19 September	Off	500	6	off	10:36:43	1	-999	2500	52.011546	143.565821	N
229	19 September	Off	500	6	off	10:38:40	3	-999	5000	51.960998	143.529982	-999
230	19 September	Off	500	6	on	10:39:22	4	-999	1250	51.942608	143.583257	SSW
231	19 September	Off	500	6	on	10:39:22	1	0	556	51.942608	143.609602	-999
232	19 September	Int	300	1	on	13:36:43	1	1	231	52.811864	143.336696	SW
233	19 September	Int	300	1	on	:13:31:32	1	0	600	52.834384	143.348125	S
234	19 September	Int	300	1	off	13:42:52	1	0	0	53.137050	143.282806	SE
235	19 September	Int	300	1	off	13:44:16	1	-999	3000	53.174166	143.319644	S
236	19 September	Int	300	1	on	13:44:40	1	0	750	53.185458	143.282782	S
237	19 September	Int	300	1	on	13:48:12	1	0	300	53.280821	143.243267	SE
238	19 September	Int	300	1	on	13:49:33	1	1	500	53.316382	143.229963	SW
239	19 September	Int	300	1	on	13:50:04	1	1	857	53.328211	143.229867	N
240	19 September	Int	300	1	on	13:50:04	1	1	1000	53.328211	143.232018	N
241	19 September	Int	300	1	on	13:51:07	1	1	857	53.352152	143.222772	N
242	19 September	Int	300	1	on	13:51:07	1	1	429	53.352152	143.216314	N
243	19 September	Int	300	1	on	13:52:47	1	1	857	53.388796	143.197103	NW
244	19 September	Int	300	1	off	14:59:21	1	-999	1500	53.347308	143.228443	N
245	19 September	Int	300	1	off	14:59:21	2	-999	3000	53.347308	143.251044	N
246	19 September	Int	300	1	on	14:59:50	1	-999	1000	53.335115	143.226442	N
247	19 September	Int	300	1	off	14:59:50	2	-999	1500	53.335115	143.233973	S
248	19 September	Int	300	1	on	15:04:32	1	1	333	53.214592	143.259180	N
249	19 September	Int	300	1	on	15:04:52	1	-999	1000	53.205725	143.282315	SW
250	19 September	Int	300	1	on	15:05:20	1	1	1000	53.193693	143.256335	SW
251	19 September	Int	300	1	on	15:07:11	2	2	600	53.145107	143.272285	N
252	19 September	Int	300	1	on	15:07:35	3	3	750	53.134764	143.272640	N
253	19 September	Int	300	1	on	15:16:46	1	1	1000	52.898328	143.349564	N
254	19 September	Int	300	1	on	15:17:11	2	2	1000	52.887588	143.321270	N
255	19 September	Int	300	1	on	15:18:49	1	0	273	52.846068	143.341601	SW
256	19 September	N/A	500		off	15:24:52	1	1	625	52.696137	143.352512	NW
257	19 September		500		off	15:57:33	1	-999	1667	51.861780	143.636874	E
258	19 September		300		off	17:38:32	2	-999	1500	52.702907	143.352627	SW
259	19 September	Int	300	2	on	17:48:47	1	0	600	52.996427	143.336357	N
260	19 September	Int	300	2	on	17:49:22	1	0	500	53.011517	143.333594	N
261	19 September	Int	300	2	on	17:51:15	0	1	600	53.058708	143.339905	-999
262	19 September	Int	300	2	off	17:55:08	1	-999	3000	53.160632	143.261030	-999
263	19 September	Int	300	2	on	17:57:04	4	-999	1000	53.212548	143.279401	-999
264	19 September	Int	300	2	on	17:57:43	1	-999	750	53.230455	143.277545	-999
265	19 September	Int	300	2	on	17:59:27	1	-999	429	53.278837	143.262895	-999
266	19 September	Int	300	2	on	17:59:27	1	0	500	53.278837	143.276863	S
267	19 September	Int	300	2	off	18:01:38	2	-999	3000	53.340265	143.198099	S
268	20 September	Int	300	2	off	9:48:03	1	-999	1500	53.382869	143.241707	N
269	20 September	Int	300	2	off	9:53:25	4	-999	3000	53.235422	143.242208	N
270	20 September	Int	300	2	on	9:55:06	1	0	250	53.190431	143.299717	SW
271	20 September	Int	300	2	off	10:04:32	1	-999	3000	52.927017	143.313201	N
272	20 September	Int	300	2	on	10:06:59	2	-999	500	52.859430	143.377019	W
273	20 September	Int	300	2	on	10:08:17	1	0	600	52.821026	143.360259	S
274	20 September	Int	300	2	on	10:10:40	1	-999	750	52.752120	143.379986	NW
275	20 September	Off	500	6	off	12:50:03	2	-999	10000	51.917750	143.454355	-999
276	20 September	Off	500	6	on	12:54:19	1	0	556	52.033959	143.593041	S
277	20 September	Int	300	1	on	13:20:17	1	1	429	52.722514	143.327586	NE
278	20 September	Int	300	1	on	13:22:41	1	1	429	52.785149	143.344927	-999

Sighting ID	Date	Survey Type	Altitude, m ASL	Line	On transect or off	Time	# of gray whales	Plumes	Offset, m	Latitude, digital degrees	Longitude, digital degrees	Orientation
279	20 September	Int	300	1	off	13:35:11	4	-999	6000	53.086764	143.387112	N
280	20 September	Int	300	1	off	13:38:40	2	-999	3000	53.177117	143.319894	N
281	20 September	Int	300	1	on	13:41:00	1	1	857	53.234602	143.267486	N
282	20 September	Int	300	1	on	13:41:37	1	1	1000	53.249424	143.263582	N
283	20 September	Int	300	1	on	13:41:37	1	1	750	53.249424	143.259823	N
284	20 September	Int	300	1	on	13:41:37	1	1	1000	53.249424	143.263582	N
285	20 September	Off	500	11	off	16:56:00	5	-999	5000	51.943678	143.549906	E
286	20 September	Off	500	11	off	16:56:00	3-4	-999	10000	51.988650	143.549906	E
287	20 September	Int	300	1	off	17:45:51	1	-999	3000	52.755302	143.386286	N
288	20 September	Int	300	1	on	17:47:50	3	0	1000	52.811633	143.354276	N
289	20 September	Int	300	1	on	17:49:13	1	1	857	52.849157	143.350708	N
290	20 September	Int	300	1	on	17:52:56	1	0	750	52.946763	143.335914	NW
291	20 September	Int	300	1	off	17:54:27	2	-999	3000	52.986851	143.362707	S
292	20 September	Int	300	1	off	17:56:10	1	-999	6000	53.033452	143.399006	N
293	20 September	Int	300	1	off	18:03:49	1	-999	3000	53.236211	143.300805	SW
294	20 September	Int	300	1	on	18:04:12	1	0	500	53.247369	143.257959	N
295	20 September	Int	300	1	on	18:05:08	1	0	1000	53.271047	143.255113	N
296	20 September	Int	300	1	on	18:07:51	2	0	375	53.341820	143.217924	NE
297	20 September	Int	300	1	on	19:09:09	2	0	300	53.375638	143.197953	N
298	21 September	Int	300	2	off	9:34:00	1	-999	1500	53.393244	143.191903	S
299	21 September	Int	300	2	off	9:34:00	1	-999	3000	53.393244	143.169278	-999
300	21 September	Int	300	2	off	9:37:17	3	-999	3000	53.297451	143.219087	N
301	21 September	Int	300	2	on	9:37:34	1	0	333	53.288965	143.273370	W
302	21 September	Int	300	2	off	9:38:31	2	-999	6000	53.261424	143.192629	-999
303	21 September	Int	300	2	on	9:39:55	1	0	250	53.220541	143.291094	S
304	21 September	Int	300	2	on	9:51:43	1	0	750	52.861694	143.355302	N
305	21 September		300		off	9:57:11	1	-999	0	52.690022	143.370718	-999
306	21 September	Ext	500	22	on	13:05:09	1	1	1667	52.909241	143.349003	SE
307	21 September	Int	300	1	on	13:07:44	1	1	600	52.947691	143.316610	S
308	21 September	Int	300	1	on	13:08:00	1	-999	750	52.954552	143.312947	-999
309	21 September	Int	300	1	on	13:17:10	1	0	333	53.196241	143.274309	N
310	21 September	Int	300	1	on	13:19:47	2	0	333	53.266209	143.248922	N
311	21 September	Int	300	1	on	13:20:08	3	0	750	53.274652	143.251623	N
312	21 September	Int	300	1	on	13:23:24	1	0	600	53.355918	143.212702	NW
313	21 September	Int	300	1	on	13:24:52	1	0	750	53.389075	143.195208	N
314	22 September	Int	300	2	on	11:07:17	2	0	750	53.479106	143.149071	S
315	22 September	Int	300	2	on	11:10:00	1	0	375	53.403790	143.201280	NW
316	22 September	Int	300	2	on	11:15:39	2	0	750	53.245765	143.269510	N
317	22 September	Int	300	2	on	11:16:09	2	0	857	53.233073	143.271530	N
318	22 September	Int	300	2	on	11:16:09	1	1	857	53.233073	143.271530	N
319	22 September	Ext	500	26	on	12:26:53	1	-999	1667	53.235618	143.351385	-999
320	22 September	Ext	500	26	off	12:26:55	1	-999	5000	53.205884	143.337185	-999
321	22 September	Ext	500	26	off	12:26:55	1	-999	2500	53.228370	143.337185	-999
322	22 September	Ext	500	26	off	12:28:21	1	-999	2500	53.228885	143.281052	-999
323	22 September	Ext	500	26	on	12:28:42	2	2	455	53.247239	143.268794	N
324	22 September	Ext	500	26	on	12:28:42	1	0	455	53.247239	143.268794	N
325	22 September	Ext	500	27	on	12:29:18	1	0	500	53.253345	143.249940	E
326	22 September	Ext	500	27	on	12:32:25	1	1	833	53.332148	143.216254	NW
327	22 September	Ext	500	28	on	13:03:02	1	1	1667	53.441853	143.174917	N
328	22 September	Ext	500	28	on	13:03:02	1	1	833	53.434358	143.174917	N
329	22 September	Ext	500	29	on	13:04:49	2	2	1667	53.450069	143.163531	N
330	21 October	Int	300	2	on	10:07:59	1	0	1000	53.350779	143.222999	N
331	21 October	Int	300	2	on	10:09:43	1	0	857	53.300756	143.247123	N
332	21 October	Int	300	2	on	10:12:03	0	1	250	53.234178	143.288902	-999
333	21 October	Int	300	2	on	10:20:49	1	0	500	52.983917	143.339634	S
334	21 October	Int	300	2	on	10:25:56	1	0	250	52.839968	143.363386	S
335	21 October	Int	300	1	on	13:38:30	1	0	1000	52.878056	143.351837	E

Sighting ID	Date	Survey Type	Altitude, m ASL	Line	On transect or off	Time	# of gray whales	Plumes	Offset, m	Latitude, digital degrees	Longitude, digital degrees	Orientation
336	21 October	Int	300	1	on	13:48:57	1	0	750	53.220370	143.273044	W
337	21 October	Int	300	1	on	13:51:15	3	3	250	53.295584	143.227642	N
338	21 October	Int	300	1	on	13:51:48	0	1	333	53.310454	143.230291	-999
339	21 October	Int	300	1	on	13:52:46	2	0	429	53.341107	143.219455	N
340	21 October	Int	300	1	on	13:53:26	1	1	300	53.365300	143.194621	NE
341	21 October	Int	300	1	on	13:53:26	1	1	273	53.365300	143.195032	S
342	21 October	Int	300	1	on	13:57:15	1	-999	353	53.474541	143.126298	S
343	21 October	Int	300	1	on	15:08:04	1	-999	1000	53.357887	143.184008	N
344	21 October	Int	300	1	on	15:08:38	1	1	600	53.342282	143.199137	N
345	21 October	Int	300	1	on	15:09:04	1	1	600	53.330898	143.206709	N
346	21 October	Int	300	1	on	15:09:15	3	0	750	53.327100	143.206350	N
347	21 October	Int	300	1	on	15:10:40	1	0	750	53.290756	143.244830	S
348	21 October	Int	300	1	on	15:11:31	0	1	333	53.265222	143.248095	-999
349	21 October	Int	300	1	on	15:13:11	1	1	600	53.219608	143.253864	N
350	21 October	Int	300	1	on	15:13:11	1	1	500	53.219608	143.255366	N
351	21 October	Int	300	2	on	17:35:55	1	-999	375	52.842785	143.361878	-999
352	26 October	Int	300	1	on	9:52:50	0	1	375	53.454731	143.149457	-999
353	26 October	Int	300	1	on	9:57:45	1	0	429	53.308454	143.232175	S
354	26 October	Int	300	1	off	10:01:26	1	0	0	53.196766	143.270817	N
355	26 October	Int	300	1	off	10:02:00	1	0	231	53.177776	143.278920	NW
356	26 October	Int	300	2	on	10:23:50	2	0	375	52.844142	143.363750	N
357	26 October	Int	300	2	off	10:38:17	1	0	231	53.264980	143.271289	E
358	26 October	Int	300	2	off	10:39:30	2	-999	0	53.298953	143.260265	-999
359	26 October	Int	300	2	on	10:41:30	1	0	300	53.360665	143.237101	N
360	26 October	Int	300	3	on	10:50:26	1	0	429	53.449087	143.214510	N
361	26 October	Int	300	3	on	11:07:13	1	0	300	52.897781	143.398881	NW
362	26 October	Int	300	4	on	11:41:10	0	1	750	53.439876	143.236661	-999
363	28 October	Int	300	1	off	9:40:40	3	-999	0	53.371920	143.195168	-999
364	28 October	Int	300	1	on	9:43:21	1	-999	429	53.304398	143.221113	SW
365	28 October	Int	300	1	on	9:44:28	3	-999	375	53.276750	143.244432	-999
366	28 October	Int	300	1	on	9:44:38	1	-999	375	53.272346	143.246475	-999
367	28 October	Int	300	1	on	9:47:17	1	-999	300	53.231195	143.261640	-999
368	28 October	Int	300	1	on	9:47:47	1	0	600	53.195034	143.261326	S
369	28 October	Int	300		0ff	12:22:25	1	0	750	53.512681	143.127005	S
370	29 November	Off	500	9	on	13:04:08	2	0	714	51.873284	143.741833	SE
371	29 November	Off	500	7	on	13:37:40	1	0	556	52.143522	143.639108	SE
372	2 December	Int	300	2	on	10:59:50	1	0	250	53.208750	143.293729	S

APPENDIX 2

Environmental and weather conditions during aerial surveys in 2003.

Case ID	Date	Survey Type	Line	Block	Time start	Time end	Wind Direction	Overcast (%)	Sea state (0-4)	Visibility left, m	Visibility right, m	Glare Left	Glare Right	White caps Left	White caps Right	Fog Left	Fog Right	Ice
1	5 June	Int	4	5	16:01:27	16:07:33	W	0	0.5	~10000	~10000	0	1	0	0	0	0	2
2	5 June	Int	4	4	16:07:33	16:11:58	W	0	0	~10000	~10000	0	1	0	0	0	0	2
3	5 June	Int	4	3	16:11:58	16:17:14	W	0	0	~10000	~10000	0	1	0	0	0	0	3
4	5 June	Int	4	2	16:17:14	16:21:59	W	0	0	~10000	~10000	0	1	0	0	0	0	4
5	5 June	Int	4	1	16:21:59	16:27:38	SW	0	0	~10000	~10000	0	1	0	0	0	0	3
6	5 June	Int	1	1	16:31:07	16:37:04	SW	0	0.5	~10000	~10000	0	0	0	0	0	0	1
7	5 June	Int	1	2	16:37:04	16:42:08	W	0	0	~10000	~10000	0	0	0	0	0	0	2
8	5 June	Int	1	3	16:42:08	16:48:02	W	0	0	~10000	~10000	0	0	0	0	0	0	2
9	5 June	Int	1	4	16:48:02	16:52:56	W	0	0	~10000	~10000	0	0	0	0	0	0	0
10	5 June	Int	1	5	16:52:56	16:59:00	W	0	0	~10000	~10000	1	0	0	0	0	0	0
11	5 June	Int	3	5	17:01:27	17:06:51	W	0	1	~10000	~10000	0	1	0	0	0	0	2
12	5 June	Int	3	4	17:06:51	17:11:18	W	0	0	~10000	~10000	0	1	0	0	0	0	2
13	5 June	Int	3	3	17:11:18	17:16:43	W	0	0	~10000	~10000	0	1	0	0	0	0	1
14	5 June	Int	3	2	17:16:43	17:21:36	W	0	0	~10000	~10000	0	1	0	0	0	0	1
15	5 June	Int	3	1	17:21:36	17:27:14	SW	0	0	~10000	~10000	0	1	0	0	0	0	1
16	5 June	Int	2	1	17:29:27	17:35:29	SW	0	0	~10000	~10000	1	0	0	0	0	0	1
17	5 June	Int	2	2	17:35:29	17:41:08	W	0	0	~10000	~10000	1	0	0	0	0	0	1
18	5 June	Int	2	3	17:41:08	17:47:20	W	0	0	~10000	~10000	1	0	0	0	0	0	1
19	5 June	Int	2	4	17:47:20	17:52:27	W	0	0	~10000	~10000	1	0	0	0	0	0	0.5
20	5 June	Int	2	5	17:52:27	17:58:49	W	0	0	~10000	~10000	1	0	0	0	0	0	0.5
21	6 June	Int	1	5	9:05:22	9:11:05	SW	0	0	~10000	~10000	0	0	0	0	0	0	1
22	6 June	Int	1	4	9:11:05	9:15:51	SW	0	0	~10000	~10000	0	0	0	0	0	0	1
23	6 June	Int	1	3	9:15:51	9:22:03	SW	0	0.5	~10000	~10000	0	0	0	0	0	0	1
24	6 June	Int	1	2	9:22:03	9:28:08	SW	0	0.5	~10000	~10000	0	0	0	0	0	0	0
25	6 June	Int	1	1	9:28:08	9:34:52	SW	0	0.5	~10000	~10000	0	0	0	0	0	0	0.5
26	6 June	Off	9	6	9:46:48	9:51:06	SW	0	0.5	~10000	~10000	0	0	0	0	0	0	2
27	6 June	Off	9	5	9:51:06	9:54:19	SW	0	0.5	~10000	~10000	0	0	0	0	0	0	0
28	6 June	Off	9	4	9:54:19	9:58:07	SW	0	0.5	~10000	~10000	0	0	0	0	0	0	0
29	6 June	Off	9	3	9:58:07	10:01:26	SW	0	0	~10000	~10000	0	0	0	0	0	0	0
30	6 June	Off	9	2	10:01:26	10:04:43	SW	0	0	~10000	~10000	0	0	0	0	0	0	0
31	6 June	Off	9	1	10:04:43	10:08:08	SW	0	0	~10000	~10000	0	0	0	0	0	0	0
32	6 June	Off	8	1	10:09:33	10:12:17	SW	0	0	~10000	~10000	0	0	0	0	0	0	0
33	6 June	Off	8	2	10:12:17	10:14:44	SW	0	0	~10000	~10000	0	0	0	0	0	0	0
34	6 June	Off	8	3	10:14:44	10:17:19	SW	0	0	~10000	~10000	0	0	0	0	0	0	0
35	6 June	Off	8	4	10:17:19	10:20:28	SW	0	0	~10000	~10000	0	0	0	0	0	0	0
36	6 June	Off	8	5	10:20:28	10:22:47	SW	0	0	~10000	~10000	0	0	0	0	0	0	1
37	6 June	Off	8	6	10:22:47	10:25:41	SW	0	0	~10000	~10000	0	0	0	0	0	0	2
38	6 June	Off	7	6	10:27:45	10:31:24	SW	0	0	~10000	~10000	1	0	0	0	0	0	2
39	6 June	Off	7	5	10:31:24	10:34:51	SW	0	0	~10000	~10000	1	0	0	0	0	0	2
40	6 June	Off	7	4	10:34:51	10:38:31	SW	0	0	~10000	~10000	1	0	0	0	0	0	1
41	6 June	Off	7	3	10:38:31	10:41:49	SW	0	0	~10000	~10000	1	0	0	0	0	0	0
42	6 June	Off	7	2	10:41:49	10:45:16	SW	0	0	~10000	~10000	1	0	0	0	0	0	0
43	6 June	Off	7	1	10:45:16	10:48:43	SW	0	0	~10000	~10000	1	0	0	0	0	0	0
44	6 June	Off	6	1	10:54:17	10:56:53	SW	0	0	~10000	~10000	0	0	0	0	0	0	0
45	6 June	Off	6	2	10:56:53	10:59:23	SW	0	0	~10000	~10000	0	0	0	0	0	0	0
46	6 June	Off	6	3	10:59:23	11:01:53	SW	0	0	~10000	~10000	0	0	0	0	0	0	0
47	6 June	Off	6	4	11:01:53	11:04:40	SW	0	0	~10000	~10000	0	0	0	0	0	0	2
48	6 June	Off	6	5	11:04:40	11:07:18	SW	0	0	~10000	~10000	0	0	0	0	0	0	2
49	6 June	Off	6	6	11:07:18	11:10:06	SW	0	0	~10000	~10000	0	0	0	0	0	0	2
50	6 June	Off	5	6	11:13:30	11:16:40	SW	0	0	~10000	~10000	0	0	0	0	0	0	2

Case ID	Date	Survey Type	Line	Block	Time start	Time end	Wind Direction	Overcast (%)	Sea state (0-4)	Visibility left, m	Visibility right, m	Glare Left	Glare Right	White caps Left	White caps Right	Fog Left	Fog Right	Ice
51	6 June	Off	5	5	11:16:40	11:19:59	SW	0	0	~10000	~10000	0	0	0	0	0	0	2
52	6 June	Off	5	4	11:19:59	11:23:18	SW	0	0	~10000	~10000	0	0	0	0	0	0	2
53	6 June	Off	5	3	11:23:18	11:26:52	SW	0	0	~10000	~10000	0	0	0	0	0	0	0
54	6 June	Off	5	2	11:26:52	11:30:23	SW	0	0	~10000	~10000	0	0	0	0	0	0	0
55	6 June	Off	5	1	11:30:23	11:34:04	SW	0	0	~10000	~10000	0	0	0	0	0	0	0
56	6 June	Off	4	1	11:35:37	11:38:18	SW	0	0	~10000	~10000	0	0	0	0	0	0	0
57	6 June	Off	4	2	11:38:18	11:40:54	SW	0	0	~10000	~10000	0	0	0	0	0	0	0
58	6 June	Off	4	3	11:40:54	11:43:43	SW	0	0	~10000	~10000	0	0	0	0	0	0	3
59	6 June	Off	4	4	11:43:43	11:46:20	SW	0	0	~10000	~10000	0	0	0	0	0	0	3
60	6 June	Off	4	5	11:46:20	11:48:55	SW	0	0	~10000	~10000	0	0	0	0	0	0	3
61	6 June	Off	4	6	11:48:55	11:51:35	SW	0	0	~10000	~10000	0	0	0	0	0	0	2
62	6 June	Off	3	6	11:53:18	11:57:08	SW	0	0	~10000	~10000	0	0	0	0	0	0	2
63	6 June	Off	3	5	11:57:08	12:00:30	SW	0	0	~10000	~10000	0	0	0	0	0	0	3
64	6 June	Off	3	4	12:00:30	12:03:47	SW	0	0	~10000	~10000	0	0	0	0	0	0	2
65	6 June	Off	3	3	12:03:47	12:07:18	SW	0	0	~10000	~10000	0	0	0	0	0	0	3
66	6 June	Off	3	2	12:07:18	12:10:40	SW	0	0	~10000	~10000	0	0	0	0	0	0	0
67	6 June	Off	3	1	12:10:40	12:14:15	SW	0	0	~10000	~10000	0	0	0	0	0	0	0
68	6 June	Int	2	1	12:43:50	12:48:19	SW	0	0.5	~10000	~10000	0	0	0	0	0	0	0.5
69	6 June	Int	2	2	12:48:19	12:52:36	SW	0	0.5	~10000	~10000	0	0	0	0	0	0	0.5
70	6 June	Int	2	3	12:52:36	12:57:26	SW	0	0.5	~10000	~10000	0	0	0	0	0	0	0.5
71	6 June	Int	2	4	12:57:26	13:01:31	SW	0	0.5	~10000	~10000	0	0	0	0	0	0	0.5
72	6 June	Int	2	5	13:01:31	13:06:42	SW	0	0.5	~10000	~10000	0	0	0	0	0	0	0.5
73	7 June	Int	1	5	9:45:29	9:51:08	W	0	0.5	~10000	~10000	1	0	0	0	0	0	0.5
74	7 June	Int	1	4	9:51:08	9:55:49	W	0	0.5	~10000	~10000	1	0	0	0	0	0	0.5
75	7 June	Int	1	3	9:55:49	10:01:27	W	0	0.5	~10000	~10000	1	0	0	0	0	0	0
76	7 June	Int	1	2	10:01:27	10:06:33	W	0	0.5	~10000	~10000	1	0	0	0	0	0	0
77	7 June	Int	1	1	10:06:33	10:12:11	W	0	0.5	~10000	~10000	1	0	0	0	0	0	0
78	7 June	Int	2	1	13:03:36	13:09:01	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0
79	7 June	Int	2	3	13:09:01	13:13:54	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0
80	7 June	Int	2	4	13:13:54	13:19:25	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0
81	7 June	Int	2	5	13:19:25	13:24:03	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0.5
82	7 June	Int	2	5	13:24:03	13:29:46	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0.5
83	7 June	Int	3	5	14:30:59	14:36:38	W	0	0	~10000	~10000	0	1	0	0	0	0	1
84	7 June	Int	3	4	14:36:38	14:41:05	W	0	0	~10000	~10000	0	1	0	0	0	0	0
85	7 June	Int	3	3	14:41:05	14:46:37	W	0	0	~10000	~10000	0	1	0	0	0	0	0
86	7 June	Int	3	2	14:46:37	14:51:48	W	0	0	~10000	~10000	0	1	0	0	0	0	2
87	7 June	Int	3	1	14:51:48	14:57:41	W	0	0	~10000	~10000	0	1	0	0	0	0	0
88	7 June	Int	4	1	17:06:59	17:12:35	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0.5
89	7 June	Int	4	2	17:12:35	17:17:22	W	0	0.5	~10000	~10000	0	0	0	0	0	0	2
90	7 June	Int	4	3	17:17:22	17:22:44	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0.5
91	7 June	Int	4	4	17:22:44	17:27:26	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0.5
92	7 June	Int	4	5	17:27:26	17:33:23	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0.5
93	7 June	Lun	1	5	10:41:35	10:47:06	W	0	0.5	~10000	~10000	1	0	0	0	0	0	0
94	7 June	Lun	1	4	10:47:06	10:53:10	W	0	0.5	~10000	~10000	1	0	0	0	0	0	0
95	7 June	Lun	1	3	10:53:10	10:58:54	W	0	0.5	~10000	~10000	1	0	0	0	0	0	0
96	7 June	Lun	1	2	10:58:54	11:04:34	W	0	0.5	~10000	~10000	1	0	0	0	0	0	0
97	7 June	Lun	1	1	11:04:34	11:10:06	W	0	0.5	~10000	~10000	1	0	0	0	0	0	0
98	7 June	Lun	3	1	11:12:04	11:17:22	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0
99	7 June	Lun	3	2	11:17:22	11:22:44	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0
100	7 June	Lun	3	3	11:22:44	11:28:02	W	0	0	~10000	~10000	0	0	0	0	0	0	0
101	7 June	Lun	3	4	11:28:02	11:33:!7	W	0	0	~10000	~10000	0	0	0	0	0	0	0
102	7 June	Lun	3	5	11:33:!7	11:38:40	W	0	0	~10000	~10000	0	0	0	0	0	0	2
103	7 June	Lun	5	5	11:40:35	11:46:09	W	0	0	~10000	~10000	0	0	0	0	0	0	2
104	7 June	Lun	5	4	11:46:09	11:52:06	W	0	0	~10000	~10000	0	0	0	0	0	0	1

Case ID	Date	Survey Type	Line	Block	Time start	Time end	Wind Direction	Overcast (%)	Sea state (0-4)	Visibility left, m	Visibility right, m	Glare Left	Glare Right	White caps Left	White caps Right	Fog Left	Fog Right	Ice
105	7 June	Lun	5	3	11:52:06	11:57:54	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0
106	7 June	Lun	5	2	11:57:54	12:03:33	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0
107	7 June	Lun	5	1	12:03:33	12:09:11	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0
108	7 June	Lun	7	1	12:10:50	12:16:10	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0
109	7 June	Lun	7	2	12:16:10	12:21:53	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0
110	7 June	Lun	7	3	12:21:53	12:26:54	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0
111	7 June	Lun	7	4	12:26:54	12:32:15	W	0	0.5	~10000	~10000	0	0	0	0	0	0	1
112	7 June	Lun	7	5	12:32:15	12:38:24	W	0	0.5	~10000	~10000	0	0	0	0	0	0	3
113	7 June	Lun	9	5	15:32:00	15:37:33	W	0	0.5	~10000	~10000	0	1	0	0	0	0	0.5
114	7 June	Lun	9	4	15:37:33	15:43:02	W	0	0.5	~10000	~10000	0	1	0	0	0	0	0
115	7 June	Lun	9	3	15:43:02	15:48:18	W	0	0.5	~10000	~10000	0	1	0	0	0	0	0
116	7 June	Lun	9	2	15:48:18	15:53:40	W	0	0.5	~10000	~10000	0	1	0	0	0	0	0
117	7 June	Lun	9	1	15:53:40	15:59:29	W	0	0.5	~10000	~10000	0	1	0	0	0	0	0
118	7 June	Lun	11	1	16:04:02	16:09:48	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0
119	7 June	Lun	11	2	16:09:48	16:15:47	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0
120	7 June	Lun	11	3	16:15:47	16:27:39	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0
121	7 June	Lun	11	4	16:27:39	16:27:33	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0
122	7 June	Lun	11	5	16:27:33	16:33:26	W	0	0.5	~10000	~10000	0	0	0	0	0	0	1
123	7 June	Off	2	1	12:39:59	12:42:26	W	0	0	~10000	~10000	0	0	0	0	0	0	3
124	7 June	Off	2	2	12:42:26	12:45:21	W	0	0	~10000	~10000	0	0	0	0	0	0	2
125	7 June	Off	2	3	12:45:21	12:48:06	W	0	0	~10000	~10000	0	0	0	0	0	0	2
126	7 June	Off	2	4	12:48:06	12:50:54	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0
127	7 June	Off	2	5	12:50:54	12:53:55	W	0	0.5	~10000	~10000	0	0	0	0	0	0	0
128	7 June	Off	5	6	15:07:54	15:11:17	W	0	0	~10000	~10000	0	1	0	0	0	0	2
129	7 June	Off	5	5	15:11:17	15:14:19	W	0	0	~10000	~10000	0	1	0	0	0	0	2
130	7 June	Off	5	4	15:14:19	15:17:17	W	0	0	~10000	~10000	0	1	0	0	0	0	1
131	7 June	Off	5	3	15:17:17	15:20:23	W	0	1	~10000	~10000	0	1	0	0	0	0	0
132	7 June	Off	5	2	15:20:23	15:23:24	W	0	1	~10000	~10000	0	1	0	0	0	0	0
133	7 June	Off	5	1	15:23:24	12:26:36	W	0	1	~10000	~10000	0	1	0	0	0	0	0
134	7 June	Off	6	1	16:39:13	16:42:05	W	0	0	~10000	~10000	0	0	0	0	0	0	0
135	7 June	Off	6	2	16:42:05	16:44:47	W	0	0	~10000	~10000	0	0	0	0	0	0	0
136	7 June	Off	6	3	16:44:47	16:47:37	W	0	0	~10000	~10000	0	0	0	0	0	0	0
137	7 June	Off	6	4	16:47:37	16:50:40	W	0	0	~10000	~10000	0	0	0	0	0	0	1
138	7 June	Off	6	5	16:50:40	16:53:47	W	0	0	~10000	~10000	0	0	0	0	0	0	2
139	7 June	Off	6	6	16:53:47	16:56:22	W	0	0	~10000	~10000	0	0	0	0	0	0	2
140	5 July	Int	4	5	11:05:40	11:12:21	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0
141	5 July	Int	4	4	11:12:21	11:17:39	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0
142	5 July	Int	4	3	11:17:39	11:23:59	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0
143	5 July	Int	4	2	11:23:59	11:29:48	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0
144	5 July	Int	4	1	11:29:48	11:36:21	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0
145	5 July	Int	1	1	11:38:50	11:44:08	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0
146	5 July	Int	1	2	11:44:08	11:48:38	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0
147	5 July	Int	1	3	11:48:38	11:53:43	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0
148	5 July	Int	1	4	11:53:43	11:58:00	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0
149	5 July	Int	1	5	11:58:00	12:03:14	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0
150	5 July	Int	3	5	12:05:22	12:12:04	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0
151	5 July	Int	3	4	12:12:04	12:17:22	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0
152	5 July	Int	3	3	12:17:22	12:23:47	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0
153	5 July	Int	3	2	12:23:47	12:29:32	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0
154	5 July	Int	3	1	12:29:32	12:36:18	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0
155	5 July	Int	2	1	12:37:24	12:42:14	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0
156	5 July	Int	2	2	12:42:14	12:46:52	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0
157	5 July	Int	2	3	12:46:52	12:51:52	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0
158	5 July	Int	2	4	12:51:52	12:56:04	S	0	0.5	~10000	~10000	0	0	0	0	0	0	0

Case ID	Date	Survey Type	Line	Block	Time start	Time end	Wind Direction	Overcast (%)	Sea state (0-4)	Visibility left, m	Visibility right, m	Glare Left	Glare Right	White caps Left	White caps Right	Fog Left	Fog Right	Ice
159	5 July	Int	2	5	12:56:04	13:01:22	S	0	0.5	≤ 300	≤ 300	0	0	0	0	1	1	0
160	8 July	Int	2	5	9:07:35	9:14:04		0	0.5	~10000	~10000	1	0	0	0	0	0	0
161	8 July	Int	2	4	9:14:04	9:19:46	S	0	0.5	~10000	~10000	1	0	0	0	0	0	0
162	8 July	Int	2	3	9:19:46	9:26:16	S	1	0.5	~10000	~10000	1	0	0	0	0	0	0
163	8 July	Int	2	2	9:26:16	9:32:15	S	2	0.5	~10000	~10000	1	0	0	0	0	0	0
164	8 July	Int	2	1	9:32:15	9:38:50	S	3	0.5	~10000	~10000	1	0	0	0	0	0	0
165	8 July	Off	9	6	9:52:58	9:56:12	S	4	0.5	~10000	~10000	1	0	0	0	0	0	0
166	8 July	Off	9	5	9:56:12	9:59:09	S	5	0.5	~10000	~10000	1	0	0	0	0	0	0
167	8 July	Off	9	4	9:59:09	10:02:14	S	6	0.5	~10000	~10000	1	0	0	0	0	0	0
168	8 July	Off	9	3	10:02:14	10:05:21	S	7	0.5	~10000	~10000	1	0	0	0	0	0	0
169	8 July	Off	9	2	10:05:21	10:08:22	S	8	0.5	~10000	~10000	1	0	0	0	0	0	0
170	8 July	Off	9	1	10:08:22	10:11:46	S	9	0.5	~10000	~10000	1	0	0	0	0	0	0
171	8 July	Off	8	1	10:12:45	10:15:51	S	10	0.5	~10000	~10000	0	0	0	0	0	0	0
172	8 July	Off	8	2	10:15:51	10:18:52	S	11	0.5	~10000	~10000	0	0	0	0	0	0	0
173	8 July	Off	8	3	10:18:52		S	12	0.5	~10000	~10000	0	0	0	0	0	0	0
174	8 July	Off	8	4		10:24:49	S	13	0.5	~10000	~10000	0	0	0	0	0	0	0
175	8 July	Off	8	5	10:24:49	10:27:50	S	14	0.5	~10000	~10000	0	0	0	0	0	0	0
176	8 July	Off	8	6	10:27:50	10:30:57	S	15	0.5	~10000	~10000	0	0	0	0	0	0	0
177	8 July	Off	7	6	10:32:31	10:35:44	S	16	0.5	~10000	~10000	1	0	0	0	0	0	0
178	8 July	Off	7	5	10:35:44	10:38:42	S	17	0.5	~10000	~10000	1	0	0	0	0	0	0
179	8 July	Off	7	4	10:38:42	10:42:05	S	18	0.5	~10000	~10000	1	0	0	0	0	0	0
180	8 July	Off	7	3	10:42:05	10:44:46	S	19	0.5	~10000	~10000	1	0	0	0	0	0	0
181	8 July	Off	7	2	10:44:46	10:48:11	S	20	0.5	~10000	~10000	1	0	0	0	0	0	0
182	8 July	Off	7	1	10:48:11	10:51:29	S	21	0.5	~10000	~10000	1	0	0	0	0	0	0
183	8 July	Off	6	1	10:52:55	10:56:03	S	22	0.5	~10000	~10000	0	0	0	0	0	0	0
184	8 July	Off	6	2	10:56:03	10:58:59	S	23	0.5	~10000	~10000	0	0	0	0	0	0	0
185	8 July	Off	6	3	10:58:59	11:02:00	S	24	0.5	~10000	~10000	0	0	0	0	0	0	0
186	8 July	Off	6	4	11:02:00	11:05:14	S	25	0.5	~10000	~10000	0	0	0	0	0	0	0
187	8 July	Off	6	5	11:05:14	11:08:11	S	26	0.5	~10000	~10000	0	0	0	0	0	0	0
188	8 July	Off	6	6	11:08:11	11:11:17	S	27	0.5	~10000	~10000	0	0	0	0	0	0	0
189	8 July	Off	5	6	11:12:56	11:16:14	S	28	0.5	~10000	~10000	1	0	0	0	0	0	0
190	8 July	Off	5	5	11:16:14	11:19:21	S	29	0.5	~10000	~10000	1	0	0	0	0	0	0
191	8 July	Off	5	4	11:19:21	11:22:21	S	30	0.5	~10000	~10000	1	0	0	0	0	0	0
192	8 July	Off	5	3	11:22:21	11:25:56	S	31	0.5	~10000	~10000	1	0	0	0	0	0	0
193	8 July	Off	5	2	11:25:56	11:28:42	S	32	0.5	~10000	~10000	1	0	0	0	0	0	0
194	8 July	Off	5	1	11:28:42	11:31:59	S	33	0.5	~10000	~10000	1	0	0	0	0	0	0
195	8 July	Off	4	1	11:33:37	11:36:46	S	34	0.5	~10000	~10000	0	0	0	0	0	0	0
196	8 July	Off	4	2	11:36:46	11:39:52	S	35	0.5	~10000	~10000	0	0	0	0	0	0	0
197	8 July	Off	4	3	11:39:52	11:43:04	S	36	0.5	~10000	~10000	0	0	0	0	0	0	0
198	8 July	Off	4	4	11:43:04	11:46:07	S	37	0.5	~10000	~10000	0	0	0	0	0	0	0
199	8 July	Off	4	5	11:46:07	11:49:01	S	38	0.5	~10000	~10000	0	0	0	0	0	0	0
200	8 July	Off	4	6	11:49:01	11:52:02	S	39	0.5	~10000	~10000	0	0	0	0	0	0	0
201	8 July	Off	3	6	11:53:27	11:56:50	S	40	0.5	~10000	~10000	1	0	0	0	0	0	0
202	8 July	Off	3	5	11:56:50	11:59:55	S	41	0.5	~10000	~10000	1	0	0	0	0	0	0
203	8 July	Off	3	4	11:59:55	12:03:05	S	42	0.5	~10000	~10000	1	0	0	0	0	0	0
204	8 July	Off	3	3	12:03:05	12:06:19	S	43	0.5	~10000	~10000	1	0	0	0	0	0	0
205	8 July	Off	3	2	12:06:19	12:09:22	S	44	0.5	~10000	~10000	1	0	0	0	0	0	0
206	8 July	Off	3	1	12:09:22	12:12:36	S	45	0.5	~10000	~10000	1	0	0	0	0	0	0
207	8 July	Off	2	1	12:14:09	12:17:12	S	46	0.5	~10000	~10000	0	0	0	0	0	0	0
208	8 July	Off	2	2	12:17:12	12:20:09	S	47	0.5	~10000	~10000	0	0	0	0	0	0	0
209	8 July	Off	2	3	12:20:09	12:23:18	S	48	0.5	~10000	~10000	0	0	0	0	0	0	0
210	8 July	Off	2	4	12:23:18	12:26:23	S	49	0.5	~10000	~10000	0	0	0	0	0	0	0
211	8 July	Off	2	5	12:26:23	12:29:02	S	50	0.5	~10000	~10000	0	0	0	0	0	0	0
212	8 July	Off	2	6	12:29:02	12:32:14	S	51	0.5	~10000	~10000	0	0	0	0	0	0	0

Case ID	Date	Survey Type	Line	Block	Time start	Time end	Wind Direction	Overcast (%)	Sea state (0-4)	Visibility left, m	Visibility right, m	Glare Left	Glare Right	White caps Left	White caps Right	Fog Left	Fog Right	Ice
213	8 July	Int	1	1	12:41:21	12:46:38	S	52	0.5	~10000	~10000	0	0	0	0	0	0	0
214	8 July	Int	1	2	12:46:38	12:51:25	S	53	2	~10000	~10000	0	0	0	0	0	0	0
215	8 July	Int	1	3	12:51:25	12:56:48	S	54	0.5	~10000	~10000	0	0	0	0	0	0	0
216	8 July	Int	1	4	12:56:48	13:01:17	S	55	0.5	~10000	~10000	0	0	0	0	0	0	0
217	8 July	Int	1	5	13:01:17	13:06:57	S	56	1	~10000	~10000	0	0	0	0	0	0	0
218	8 July	Ext	34	34	14:23:16	14:36:50	S	57	0.5	~10000	~10000	0	1	0	0	0	0	0
219	8 July	Ext	33	33	14:40:49	14:54:55	S	58	1	~10000	~10000	1	0	0	0	0	0	0
220	8 July	Ext	32	32	14:59:07	15:14:17	S	59	1	~10000	~10000	0	1	0	0	0	0	0
221	8 July	Ext	31	31	15:18:00	15:31:49	S	60	1	~10000	~10000	1	0	0	0	0	0	0
222	8 July	Ext	30	30	15:35:53	15:49:29	S	61	3	~10000	~10000	0	1	1	1	0	0	0
223	8 July	Ext	29	29	15:53:22	16:06:21	S	62	2	~10000	~10000	1	0	0	0	0	0	0
224	8 July	Ext	28	28	16:10:31	16:23:21	S	63	3	~10000	~10000	0	1	1	1	0	0	0
225	8 July	Ext	27	27	16:27:05	16:39:59	S	64	2	~10000	~10000	1	0	0	0	0	0	0
226	9 July	Ext	26		9:31:36	9:45:55	SE	0	1	~10000	~10000	0	0	0	0	0	0	0
227	9 July	Ext	25		9:47:20	10:00:33	SE	0	1	~10000	~10000	0	0	0	0	0	0	0
228	9 July	Ext	24		10:04:45	10:16:55	SE	0	1	~10000	~10000	0	1	0	0	0	0	0
229	9 July	Ext	23		10:20:50	10:33:32	SE	0	1	~10000	~10000	0	0	0	0	0	0	0
230	9 July	Ext	22		10:37:38	10:49:47	SE	0	1	~10000	~10000	0	1	0	0	0	0	0
231	9 July	Ext	21		10:53:51	11:06:44	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
232	9 July	Ext	20		11:10:53	11:22:50	SE	0	1	~10000	~10000	0	1	0	0	0	0	0
233	9 July	Ext	19		11:26:32	11:38:31	SE	0	1	~10000	~10000	0	0	0	0	0	0	0
234	9 July	Ext	18		11:42:26	11:54:31	SE	0	1	~10000	~10000	0	1	0	0	0	0	0
235	9 July	Ext	17		11:56:16	12:10:44	SE	0	1	~10000	~10000	0	0	0	0	0	0	0
236	9 July	Ext	16		12:15:07	12:28:40	SE	0	1	~10000	~10000	0	1	0	0	0	0	0
237	9 July	Ext	15		21:32:14	12:45:30	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
238	9 July	Int	2	1	12:57:17	13:02:17	SE	0	1	~10000	~10000	0	0	0	0	0	0	0
239	9 July	Int	2	2	13:02:17	13:06:44	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
240	9 July	Int	2	3	13:06:44	13:11:33	SE	0	3	~10000	~10000	1	1	0	0	0	0	0
241	9 July	Int	2	4	13:11:33	13:15:34	SE	0	3	~10000	~10000	1	1	0	0	0	0	0
242	9 July	Int	2	5	13:15:34	13:20:43	SE	0	3	~10000	~10000	1	1	0	0	0	0	0
243	9 July	Int	1	1	14:19:19	14:27:06	SE	0	3	~10000	~10000	0	1	1	1	0	0	0
244	9 July	Int	1	2	14:27:06	14:33:14	SE	0	2	~10000	~10000	0	1	0	0	0	0	0
245	9 July	Int	1	3	14:33:14	14:40:06	SE	0	2	~10000	~10000	0	1	0	0	0	0	0
246	9 July	Int	1	4	14:40:06	14:46:06	SE	0	3	~10000	~10000	0	1	1	1	0	0	0
247	9 July	Int	1	5	14:46:06	14:52:55	SE	0	1	~10000	~10000	0	1	0	0	0	0	0
248	9 July	Ext	14		15:10:34	15:25:18	SE	0	1	~10000	~10000	0	0	0	0	0	0	0
249	9 July	Ext	13		15:29:27	15:43:33	SE	0	3	~10000	~10000	0	0	1	1	0	0	0
250	9 July	Ext	12		15:47:45	16:01:55	SE	0	3	~10000	~10000	0	0	1	1	0	0	0
251	9 July	Ext	11		16:05:53	16:20:54	SE	0	3	~10000	~10000	0	0	1	1	0	0	0
252	9 July	Int	1	1	16:39:34	16:43:39	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
253	9 July	Int	1	2	16:43:39	16:46:20	SE	0	3	~10000	~10000	0	0	1	1	0	0	0
254	9 July	Int	1	3	16:46:20	16:49:54	SE	0	3	~10000	~10000	0	0	1	1	0	0	0
255	9 July	Int	1	4	16:49:54		SE			n/a	n/a	Stopped survey -- lack of time						0
256	10 July	Int	2	5	9:11:45	9:18:50	SE	100	3	~10000	~10000	0	0	1	1	0	0	0
257	10 July	Int	2	4	9:18:50	9:24:48	SE	80	3	~10000	~10000	0	0	1	1	0	0	0
258	10 July	Int	2	3	9:24:48	9:31:42	SE	80	3	~10000	~10000	1	0	1	1	0	0	0
259	10 July	Int	2	2	9:31:42	9:37:56	SE	80	2	~10000	~10000	1	0	0	0	0	0	0
260	10 July	Int	2	1	9:37:56	9:44:52	SE	80	2	~10000	~10000	1	0	0	0	0	0	0
261	10 July	Lun	1	5	10:17:55	10:24:09	SE	20	2	~10000	~10000	1	0	0	0	0	0	0
262	10 July	Lun	1	4	10:24:09	10:30:18	SE	20	2	~10000	~10000	1	0	0	0	1	1	0
263	10 July	Lun								n/a	n/a							0
264	15 July	Int	2	5	9:11:34	9:17:46	SE	0	0	~10000	~10000	1	0	0	0	0	0	0
265	15 July	Int	2	4	9:17:46	9:22:44	SE	0	0.5	~10000	~10000	1	0	0	0	0	0	0

Case ID	Date	Survey Type	Line	Block	Time start	Time end	Wind Direction	Overcast (%)	Sea state (0-4)	Visibility left, m	Visibility right, m	Glare Left	Glare Right	White caps Left	White caps Right	Fog Left	Fog Right	Ice
266	15 July	Int	2	3	9:22:44	9:28:29	SE	0	0.5	~10000	~10000	1	0	0	0	0	0	0
267	15 July	Int	2	2	9:28:29	9:33:50	SE	0	0.5	~10000	~10000	1	0	0	0	0	0	0
268	15 July	Int	2	1	9:33:50	9:34:47	SE	0	0.5	~10000	~10000	1	0	0	0	0	0	0
269	15 July	0ff	7	6	9:52:53	9:56:17	SE	0	0.5	~10000	~10000	1	0	0	0	0	0	0
270	15 July	0ff	7	5	9:56:17	9:59:05	SE	0	0.5	~10000	~10000	1	0	0	0	0	0	0
271	15 July	0ff	7	4	9:59:05	10:02:35	SE	0	0.5	~10000	~10000	1	0	0	0	0	0	0
272	15 July	0ff	7	3	10:02:35	10:05:34	SE	0	0.5	~10000	~10000	1	0	0	0	0	0	0
273	15 July	0ff	7	2	10:05:34	10:08:23	SE	0	0.5	~10000	~10000	1	0	0	0	0	0	0
274	15 July	0ff	7	1	10:08:23	10:11:44	SE	0	0.5	~10000	~10000	1	0	0	0	0	0	0
275	15 July	Lun	11	5	10:19:11	10:25:28	SE	20	0.5	~10000	~10000	1	0	0	0	0	0	0
276	15 July	Lun	11	4	10:25:28	10:33:55	SE	20	0.5	~10000	~10000	1	0	0	0	0	0	0
277	15 July	Lun	11	3	10:33:55	10:38:07	SE	40	0.5	~10000	~10000	1	0	0	0	0	0	0
278	15 July	Lun	11	2	10:38:07	10:44:11	SE	60	0.5	~10000	~10000	1	0	0	0	0	0	0
279	15 July	Lun	11	1	10:44:11	10:46:29	SE	60	0.5	~10000	~10000	1	0	0	0	1	1	0
280	15 July	Lun	9	1	10:48:09	10:49:58	SE	60	0.5	0	0	0	0	0	0	0	0	0
281	15 July	Lun	9	2	10:49:58	10:56:17	SE	60	0.5	~10000	~10000	0	0	0	0	0	0	0
282	15 July	Lun	9	3	10:56:17	11:02:12	SE	60	0.5	~10000	~10000	0	0	0	0	0	0	0
283	15 July	Lun	9	4	11:02:12	11:07:53	SE	30	0.5	~10000	~10000	0	0	0	0	0	0	0
284	15 July	Lun	9	5	11:07:53	11:13:40	SE	10	0.5	~10000	~10000	0	0	0	0	0	0	0
285	15 July	Lun	7	5	11:15:21	11:21:23	SE	10	0.5	~10000	~10000	1	0	0	0	0	0	0
286	15 July	Lun	7	4	11:21:23	11:27:30	SE	10	0.5	~10000	~10000	1	0	0	0	0	0	0
287	15 July	Lun	7	3	11:27:30	11:33:31	SE	50	0.5	~10000	~10000	1	0	0	0	0	0	0
288	15 July	Lun	7	2	11:33:31	11:38:53	SE	50	0.5	~10000	~10000	1	0	0	0	0	0	0
289	15 July	Lun	5	2	11:41:17	11:46:12	SE	50	0.5	0	0	0	0	0	0	1	1	0
290	15 July	Lun	5	3	11:46:12		SE	35	0.5	~10000	~10000	0	0	0	0	0	0	0
291	15 July	Lun	5	4		11:58:04	SE	35	0.5	~10000	~10000	0	0	0	0	0	0	0
292	15 July	Lun	5	5	11:58:04	12:03:30	SE	35	0.5	~10000	~10000	0	0	0	0	0	0	0
293	15 July	Off	6	1	12:13:51	12:17:09	SE	30	0.5	~10000	~10000	0	0	0	0	0	0	0
294	15 July	Off	6	2	12:17:09	12:20:21	SE	30	0.5	~10000	~10000	0	0	0	0	0	0	0
295	15 July	Off	6	3	12:20:21	12:23:40	SE	30	0.5	~10000	~10000	0	0	0	0	0	0	0
296	15 July	Off	6	4	12:23:40	12:26:40	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
297	15 July	Off	6	5	12:26:40	12:29:53	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
298	15 July	Int	6	6	12:29:53	12:35:16	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
299	15 July	Int	1	1	12:43:41	12:49:43	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
300	15 July	Int	1	2	12:49:43	12:55:09	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
301	15 July	Int	1	3	12:55:09	13:01:16	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
302	15 July	Int	1	4	13:01:16	13:06:07	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
303	15 July	Int	1	5	13:06:07	13:11:55	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
304	15 July	Int	1	1	14:13:57	14:20:22	SE	0	0	~10000	~10000	0	1	0	0	0	0	0
305	15 July	Int	1	2	14:20:22	14:25:31	SE	0	0	~10000	~10000	0	1	0	0	0	0	0
306	15 July	Int	1	3	14:25:31	14:31:45	SE	0	0	~10000	~10000	0	1	0	0	0	0	0
307	15 July	Int	1	4	14:31:45	14:37:05	SE	0	0	~10000	~10000	0	1	0	0	0	0	0
308	15 July	Int	1	5	14:37:05	14:45:20	SE	0	0	~10000	~10000	0	1	0	0	0	0	0
309	15 July	Off	5	6	14:54:05	14:57:21	SE	0	0	~10000	~10000	0	1	0	0	0	0	0
310	15 July	Off	5	5	14:57:21	15:00:59	SE	0	0	~10000	~10000	0	1	0	0	0	0	0
311	15 July	Off	5	4	15:00:59	15:03:36	SE	0	0	~10000	~10000	0	1	0	0	0	0	0
312	15 July	Off	5	3	15:03:36	15:06:58	SE	0	0	~10000	~10000	0	1	0	0	0	0	0
313	15 July	Off	5	2	15:06:58	15:10:09	SE	0	0	~10000	~10000	0	1	0	0	0	0	0
314	15 July	Off	5	1	15:10:09	15:13:17	SE	0	0	~10000	~10000	0	1	0	0	0	0	0
315	15 July	Lun	1	5	15:19:19	15:25:19	SE	0	0	~10000	~10000	0	1	0	0	0	0	0
316	15 July	Lun	1	4	15:25:19	15:31:17	SE	0	0	~10000	~10000	0	1	0	0	0	0	0
317	15 July	Lun	1	3	15:31:17	15:37:11	SE	0	0	~10000	~10000	0	1	0	0	0	0	0
318	15 July	Lun	1	2	15:37:11	15:39:14	SE	15	0	~10000	~10000	0	0	0	0	1	1	0
319	15 July	Lun	3	2	15:41:30	15:43:35	SE	15	0	0	0	0	0	0	0	0	0	0

Case ID	Date	Survey Type	Line	Block	Time start	Time end	Wind Direction	Overcast (%)	Sea state (0-4)	Visibility left, m	Visibility right, m	Glare Left	Glare Right	White caps Left	White caps Right	Fog Left	Fog Right	Ice
320	15 July	Lun	3	3	15:43:35	15:49:33	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
321	15 July	Lun	3	4	15:49:33	15:55:18	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
322	15 July	Lun	3	5	15:55:18	16:00:52	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
323	15 July	Off	4	1	16:06:47	16:10:00	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
324	15 July	Off	4	2	16:10:00	16:13:09	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
325	15 July	Off	4	3	16:13:09	16:16:29	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
326	15 July	Off	4	4	16:16:29	16:19:36	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
327	15 July	Off	4	5	16:19:36	16:22:45	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
328	15 July	Off	4	6	16:22:45	16:25:54	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
329	15 July	Int	2	1	16:36:31	16:45:21	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
330	15 July	Int	2	2	16:45:21	16:48:02	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
331	15 July	Int	2	3	16:48:02	16:53:57	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
332	15 July	Int	2	4	16:53:57	16:58:47	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
333	15 July	Int	2	5	16:58:47	17:04:23	SE	0	0.5	~10000	~10000	0	0	0	0	0	0	0
334	18 August	Int	1	5	10:06:51	10:11:31	SE	100	2	~10000	~10000	0	0	0	0	0	0	0
335	18 August	Int	1	4	10:11:31	10:18:36	SE	100	3	~10000	~10000	0	0	1	1	0	0	0
336	18 August	Int	1	3	10:18:36	10:26:33	SE	100	3	~10000	~10000	0	0	1	1	0	0	0
337	18 August	Int	1	2	10:26:33	10:33:04	SE	100	3	~10000	~10000	0	0	1	1	0	0	0
338	18 August	Int	1	1	10:33:04	10:41:07	SE	100	3	~10000	~10000	0	0	1	1	0	0	0
339	18 August	Int	2	1	10:43:09	10:47:39	SE	100	3	~10000	~10000	0	0	1	1	0	0	0
340	18 August	Int	2	2	10:47:39	10:54:05	SE	100	3	~10000	~10000	0	0	1	1	0	0	0
341	18 August	Int	2	3	10:54:05	10:58:22	SE	100	3	~10000	~10000	0	0	1	1	0	0	0
342	18 August	Int	2	4	10:58:22	11:03:33	SE	100	3	~10000	~10000	0	0	1	1	0	0	0
343	18 August	Int	2	5	11:03:33	11:09:58	SE	100	3	~10000	~10000	0	0	1	1	0	0	0
344	19 August	Int	2	5	10:33:49	10:37:58	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
345	19 August	Int	2	4	10:37:58	10:43:30	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
346	19 August	Int	2	3	10:43:30	10:50:47	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
347	19 August	Int	2	2	10:50:47	10:57:08	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
348	19 August	Int	2	1	10:57:08	11:04:33	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
349	19 August	Lun	1	5	11:36:16	11:42:41	SW	0	1	~10000	~10000	1	0	0	0	0	0	0
350	19 August	Lun	1	4	11:42:41	11:48:51	SW	0	1	~10000	~10000	1	0	0	0	0	0	0
351	19 August	Lun	1	3	11:48:51	11:55:16	SW	0	1	~10000	~10000	1	0	0	0	0	0	0
352	19 August	Lun	1	2	11:55:16	12:01:35	SW	0	1	~10000	~10000	1	0	0	0	0	0	0
353	19 August	Lun	1	1	12:01:35	21:07:43	SW	0	1	~10000	~10000	1	0	0	0	0	0	0
354	19 August	Lun	3	1	12:09:58	12:15:27	SW	0	1	~10000	~10000	0	0	0	0	0	0	0
355	19 August	Lun	3	2	12:15:27	12:21:30	SW	0	1	~10000	~10000	0	0	0	0	0	0	0
356	19 August	Lun	3	3	12:21:30	12:27:22	SW	0	1	~10000	~10000	0	0	0	0	0	0	0
357	19 August	Lun	3	4	12:27:22	12:32:59	SW	0	1	~10000	~10000	0	0	0	0	0	0	0
358	19 August	Lun	3	5	12:32:59	12:38:31	SW	0	1	~10000	~10000	0	0	0	0	0	0	0
359	19 August	Lun	5	5	12:40:49	12:46:40	SW	0	1	~10000	~10000	1	0	0	0	0	0	0
360	19 August	Lun	5	4	12:46:40	12:53:33	SW	0	1	~10000	~10000	1	0	0	0	0	0	0
361	19 August	Lun	5	3	12:53:33	13:00:14	SW	0	1	~10000	~10000	1	0	0	0	0	0	0
362	19 August	Lun	5	2	13:00:14	13:06:48	SW	0	1	~10000	~10000	1	0	0	0	0	0	0
363	19 August	Lun	5	1	13:06:48	13:13:19	SW	0	1	~10000	~10000	1	0	0	0	0	0	0
364	19 August	Lun	7	1	13:15:09	13:21:12	SW	0	1	~10000	~10000	0	0	0	0	0	0	0
365	19 August	Lun	7	2	13:21:12	13:27:12	SW	0	1	~10000	~10000	0	0	0	0	0	0	0
366	19 August	Lun	7	3	13:27:12	13:33:02	SW	0	1	~10000	~10000	0	0	0	0	0	0	0
367	19 August	Lun	7	4	13:33:02	13:38:34	SW	0	1	~10000	~10000	0	0	0	0	0	0	0
368	19 August	Lun	7	5	13:38:34	13:44:38	SW	0	1	~10000	~10000	0	0	0	0	0	0	0
369	19 August	Int	1	1	14:08:05	14:13:47	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
370	19 August	Int	1	2	14:13:47	14:18:48	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
371	19 August	Int	1	3	14:18:48	14:24:19	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
372	19 August	Int	1	4	14:24:19	14:29:04	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
373	19 August	Int	1	5	14:29:04	14:34:54	SW	0	2	~10000	~10000	0	0	0	0	0	0	0

Case ID	Date	Survey Type	Line	Block	Time start	Time end	Wind Direction	Overcast (%)	Sea state (0-4)	Visibility left, m	Visibility right, m	Glare Left	Glare Right	White caps Left	White caps Right	Fog Left	Fog Right	Ice
374	19 August	Int	1	5	15:26:52	15:34:12	SW	0	3	~10000	~10000	0	1	1	1	0	0	0
375	19 August	Int	1	4	15:34:12	15:40:11	SW	0	3	~10000	~10000	0	1	1	1	0	0	0
376	19 August	Int	1	3	15:40:11	15:47:07	SW	0	3	~10000	~10000	0	1	1	1	0	0	0
377	19 August	Int	1	2	15:47:07	15:53:25	SW	0	2	~10000	~10000	0	1	0	0	0	0	0
378	19 August	Int	1	1	15:53:25	16:00:36	SW	0	2	~10000	~10000	0	1	0	0	0	0	0
379	19 August	Lun	9	5	16:34:33	16:40:29	SW	0	2	~10000	~10000	0	1	0	0	0	0	0
380	19 August	Lun	9	4	16:40:29	16:47:27	SW	0	2	~10000	~10000	0	1	0	0	0	0	0
381	19 August	Lun	9	3	16:47:27	16:53:37	SW	0	2	~10000	~10000	0	1	0	0	0	0	0
382	19 August	Lun	9	2	16:53:37	17:00:15	SW	0	2	~10000	~10000	0	1	0	0	0	0	0
383	19 August	Lun	9	1	17:00:15	17:07:18	SW	0	2	~10000	~10000	0	1	0	0	0	0	0
384	19 August	Lun	11	1	17:09:17	17:15:05	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
385	19 August	Lun	11	2	17:15:05	17:21:15	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
386	19 August	Lun	11	3	17:21:15	17:27:10	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
387	19 August	Lun	11	4	17:27:10	17:33:19	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
388	19 August	Lun	11	5	17:33:19	17:39:28	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
389	19 August	Int	2	1	18:00:36	18:05:56	S	0	3	~10000	~10000	1	0	1	1	0	0	0
390	19 August	Int	2	2	18:05:56	18:10:41	S	0	3	~10000	~10000	1	0	1	1	0	0	0
391	19 August	Int	2	3	18:10:41	18:15:55	S	0	3	~10000	~10000	1	0	1	1	0	0	0
392	19 August	Int	2	4	18:15:55	18:20:39	S	0	2	~10000	~10000	1	0	0	0	0	0	0
393	19 August	Int	2	5	18:20:39	18:26:09	S	0	2	~10000	~10000	1	0	0	0	0	0	0
394	20 August	Int	2	5	9:26:49	9:33:23	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
395	20 August	Int	2	4	9:33:23	9:38:56	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
396	20 August	Int	2	3	9:38:56	9:45:43	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
397	20 August	Int	2	2	9:45:43	9:52:09	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
398	20 August	Int	2	1	9:52:09	9:59:44	SW	0	2	~10000	~10000	1	0	1	1	0	0	0
399	20 August	Off	9	6	10:14:06	10:17:19	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
400	20 August	Off	9	5	10:17:19	10:21:05	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
401	20 August	Off	9	4	10:21:05	10:25:15	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
402	20 August	Off	9	3	10:25:15	10:29:03	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
403	20 August	Off	9	2	10:29:03	10:32:49	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
404	20 August	Off	9	1	10:32:49	10:36:44	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
405	20 August	Off	8	1	10:38:24	10:41:18	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
406	20 August	Off	8	2	10:41:18	10:43:45	SW	0	3	~10000	~10000	0	0	1	1	0	0	0
407	20 August	Off	8	3	10:43:45	10:47:49	SW	0	3	~10000	~10000	0	0	1	1	0	0	0
408	20 August	Off	8	4	10:47:49	10:50:38	SW	0	3	~10000	~10000	0	0	1	1	0	0	0
409	20 August	Off	8	5	10:50:38	10:53:44	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
410	20 August	Off	8	6	10:53:44	10:56:43	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
411	20 August	Off	7	6	10:58:43	11:02:40	SW	0	3	~10000	~10000	1	0	1	1	0	0	0
412	20 August	Off	7	5	11:02:40	11:06:33	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
413	20 August	Off	7	4	11:06:33	11:10:26	SW	0	3	~10000	~10000	1	0	1	1	0	0	0
414	20 August	Off	7	3	11:10:26	11:14:05	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
415	20 August	Off	7	2	11:14:05	11:17:33	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
416	20 August	Off	7	1	11:17:33	11:21:12	SW	0	3	~10000	~10000	1	0	1	1	0	0	0
417	20 August	Off	6	1	11:23:27	11:26:49	SW	0	3	~10000	~10000	0	0	1	1	0	0	0
418	20 August	Off	6	2	11:26:49	11:29:42	SW	0	3	~10000	~10000	0	0	1	1	0	0	0
419	20 August	Off	6	3	11:29:42	11:32:44	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
420	20 August	Off	6	4	11:32:44	11:35:41	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
421	20 August	Off	6	5	11:35:41	11:38:39	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
422	20 August	Off	6	6	11:38:39	11:41:38	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
423	20 August	Off	5	6	11:43:49	11:47:35	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
424	20 August	Off	5	5	11:47:35	11:51:25	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
425	20 August	Off	5	4	11:51:25	11:55:09	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
426	20 August	Off	5	3	11:55:09	11:58:53	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
427	20 August	Off	5	2	11:58:53	12:02:59	SW	0	2	~10000	~10000	1	0	0	0	0	0	0

Case ID	Date	Survey Type	Line	Block	Time start	Time end	Wind Direction	Overcast (%)	Sea state (0-4)	Visibility left, m	Visibility right, m	Glare Left	Glare Right	White caps Left	White caps Right	Fog Left	Fog Right	Ice
428	20 August	Off	5	1	12:02:59	12:06:23	SW	0	2	~10000	~10000	1	0	1	1	0	0	0
429	20 August	Off	4	1	12:08:42	12:11:34	SW	0	3	~10000	~10000	0	0	1	1	0	0	0
430	20 August	Off	4	2	12:11:34	12:14:23	SW	0	3	~10000	~10000	0	0	1	1	0	0	0
431	20 August	Off	4	3	12:14:23	12:17:17	SW	0	3	~10000	~10000	0	0	1	1	0	0	0
432	20 August	Off	4	4	12:17:17	12:20:09	SW	0	3	~10000	~10000	0	0	1	1	0	0	0
433	20 August	Off	4	5	12:20:09	12:23:05	SW	0	3	~10000	~10000	0	0	1	1	0	0	0
434	20 August	Off	4	6	12:23:05	12:25:53	SW	0	2	~10000	~10000	0	0	1	1	0	0	0
435	20 August	Off	3	6	12:27:43	12:31:20	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
436	20 August	Off	3	5	12:31:20		SW	0	2	~10000	~10000	1	0	0	0	0	0	0
437	20 August	Off	3	4		12:39:16	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
438	20 August	Off	3	3	12:39:16	12:42:27	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
439	20 August	Off	3	2	12:42:27	12:46:06	SW	0	2	~10000	~10000	1	0	1	1	0	0	0
440	20 August	Off	3	1	12:46:06	12:49:33	SW	0	3	~10000	~10000	1	0	0	0	0	0	0
441	20 August	Off	2	1	12:51:28	12:54:27	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
442	20 August	Off	2	2	12:54:27		SW	0	2	~10000	~10000	0	0	0	0	0	0	0
443	20 August	Off	2	3		13:00:04	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
444	20 August	Off	2	4	13:00:04	13:02:21	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
445	20 August	Off	2	5	13:02:21	13:04:58	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
446	20 August	Off	2	6	13:04:58	13:07:24	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
447	20 August	Int	1	1	13:15:23	13:20:48	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
448	20 August	Int	1	2	13:20:48	13:25:06	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
449	20 August	Int	1	3	13:25:06	13:30:07	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
450	20 August	Int	1	4	13:30:07	13:36:26	SW	0	1	~10000	~10000	1	0	0	0	0	0	0
451	20 August	Int	1	5	13:36:26	13:40:15	SW	0	1	~10000	~10000	1	0	0	0	0	0	0
452	20 August	Int	4	5	14:35:54	14:42:18	SW	50	1	~10000	~10000	0	0	0	1	0	0	0
453	20 August	Int	4	4	14:42:18	14:47:45	SW	30	1	~10000	~10000	0	0	0	1	0	0	0
454	20 August	Int	4	3	14:47:45	14:54:32	SW	30	1	~10000	~10000	0	0	0	1	0	0	0
455	20 August	Int	4	2	14:54:32	15:00:44	SW	30	2	~10000	~10000	0	0	0	1	0	0	0
456	20 August	Int	4	1	15:00:44	15:05:53	SW	30	2	~10000	~10000	0	0	0	1	0	0	0
457	20 August	Int	1	1	15:11:26	15:16:33	SW	30	2	~10000	~10000	0	0	0	0	0	0	0
458	20 August	Int	1	2	15:16:33	15:22:01	SW	60	1	~10000	~10000	0	0	0	0	0	0	0
459	20 August	Int	1	3	15:22:01	15:27:33	SW	60	1	~10000	~10000	0	0	0	0	0	0	0
460	20 August	Int	1	4	15:27:33	15:32:33	SW	60	1	~10000	~10000	0	0	0	1	0	0	0
461	20 August	Int	1	5	15:32:33	15:38:50	SW	50	1	~10000	~10000	0	0	0	1	0	0	0
462	20 August	Int	3	5	15:42:03	15:49:19	SW	80	2	~10000	~10000	0	0	0	0	0	0	0
463	20 August	Int	3	4	15:49:19	15:53:44	SW	80	1	~10000	~10000	0	1	0	0	0	0	0
464	20 August	Int	3	3	15:53:44	15:59:50	SW	80	1	~10000	~10000	0	0	0	0	0	0	0
465	20 August	Int	3	2	15:59:50	16:05:33	SW	60	1	~10000	~10000	0	1	0	0	0	0	0
466	20 August	Int	3	1	16:05:33	16:12:12	SW	60	2	~10000	~10000	0	1	0	0	0	0	0
467	20 August	Int	2	1	16:14:14	16:19:32	SW	60	2	~10000	~10000	0	0	0	0	0	0	0
468	20 August	Int	2	2	16:19:32	16:24:39	SW	80	2	~10000	~10000	0	0	0	0	0	0	0
469	20 August	Int	2	3	16:24:39	16:30:27	SW	80	1	~10000	~10000	0	0	0	0	0	0	0
470	20 August	Int	2	4	16:30:27	16:35:38	SW	80	1	~10000	~10000	0	0	0	0	0	0	0
471	20 August	Int	2	5	16:35:38	16:42:35	SW	80	1	~10000	~10000	0	0	0	0	0	0	0
472	18 September	Int	2	5	10:09:02	10:15:47	S	100	0.5	~10000	~10000	0	0	0	0	0	0	0
473	18 September	Int	2	4	10:15:47	10:21:27	S	100	0.5	~10000	~10000	0	0	0	0	0	0	0
474	18 September	Int	2	3	10:21:27	10:28:15	S	100	0.5	~10000	~10000	0	0	0	0	0	0	0
475	18 September	Int	2	2	10:28:15	10:35:37	S	100	0.5	~10000	~10000	0	0	0	0	0	0	0
476	18 September	Int	2	1	10:35:37	10:41:17	S	100	0.5	~10000	~10000	0	0	0	0	0	0	0
477	18 September	Off	9	6	10:55:01	10:58:37	S	100	2	~10000	~10000	0	0	0	0	0	0	0
478	18 September	Off	9	5	10:58:37	11:02:07	S	100	2	~10000	~10000	0	0	0	0	0	0	0
479	18 September	Off	9	4	11:02:07	11:06:09	S	100	2	~10000	~10000	0	0	0	0	0	0	0
480	18 September	Off	9	3	11:06:09	11:09:54	S	100	2	~10000	~10000	0	0	0	0	0	0	0
481	18 September	Off	9	2	11:09:54	11:13:37	S	100	2	~10000	~10000	0	0	0	0	0	0	0

Case ID	Date	Survey Type	Line	Block	Time start	Time end	Wind Direction	Overcast (%)	Sea state (0-4)	Visibility left, m	Visibility right, m	Glare Left	Glare Right	White caps Left	White caps Right	Fog Left	Fog Right	Ice
482	18 September	Off	9	1	11:13:37	11:17:27	S	100	1	~10000	~10000	0	0	0	0	0	0	0
483	18 September	Off	8	1	11:19:13	11:22:14	S	100	1	~10000	~10000	0	0	0	0	0	0	0
484	18 September	Off	8	2	11:22:14	11:25:19	S	100	1	~10000	~10000	0	0	0	0	0	0	0
485	18 September	Off	8	3	11:25:19	11:28:32	S	100	1	~10000	~10000	0	0	0	0	0	0	0
486	18 September	Off	8	4	11:28:32	11:31:37	S	100	1	~10000	~10000	0	0	0	0	0	0	0
487	18 September	Off	8	5	11:31:37	11:34:55	S	100	1	~10000	~10000	0	0	0	0	0	0	0
488	18 September	Off	8	6	11:34:55	11:38:13	S	100	1	~10000	~10000	0	0	0	0	0	0	0
489	18 September	Off	7	6	11:39:46	11:43:17	S	80	1	~10000	~10000	0	0	0	0	0	0	0
490	18 September	Off	7	5	11:43:17	11:46:56	S	80	1	~10000	~10000	0	0	0	0	0	0	0
491	18 September	Off	7	4	11:46:56	11:50:50	S	80	1	~10000	~10000	0	0	0	0	0	0	0
492	18 September	Off	7	3	11:50:50	11:54:11	S	80	1	~10000	~10000	0	0	0	0	0	0	0
493	18 September	Off	7	2	11:54:11	11:57:47	S	80	1	~10000	~10000	0	0	0	0	0	0	0
494	18 September	Off	7	1	11:57:47	12:01:25	S	60	1	~10000	~10000	1	0	0	0	0	0	0
495	18 September	Off	6	1	12:03:07	12:06:11	S	60	1	~10000	~10000	1	0	0	0	0	0	0
496	18 September	Off	6	2	12:06:11	12:09:24	S	60	1	~10000	~10000	0	0	0	0	0	0	0
497	18 September	Off	6	3	12:09:24	12:12:23	S	60	1	~10000	~10000	0	0	0	0	0	0	0
498	18 September	Off	6	4	12:12:23	12:15:59	S	60	1	~10000	~10000	0	0	0	0	0	0	0
499	18 September	Off	6	5	12:15:59	12:18:53	S	60	1	~10000	~10000	0	0	0	0	0	0	0
500	18 September	Off	6	6	12:18:53	12:22:00	S	60	1	~10000	~10000	0	0	0	0	0	0	0
501	18 September	Off	5	6	12:23:39	12:27:14	S	60	1	~10000	~10000	1	0	0	0	0	0	0
502	18 September	Off	5	5	12:27:14	12:30:48	S	60	1	~10000	~10000	1	0	0	0	0	0	0
503	18 September	Off	5	4	12:30:48	12:34:16	S	60	1	~10000	~10000	0	0	0	0	0	0	0
504	18 September	Off	5	3	12:34:16	12:38:04	S	60	1	~10000	~10000	0	0	0	0	0	0	0
505	18 September	Off	5	2	12:38:04	12:41:43	S	60	1	~10000	~10000	0	0	0	0	0	0	0
506	18 September	Off	5	1	12:41:43		S	60	1	~10000	~10000	0	0	0	0	0	0	0
507	18 September	Off	4	1		12:44:09	S	60	1	~10000	~10000	0	0	0	0	0	0	0
508	18 September	Off	4	2	12:44:09	12:47:22	S	60	1	~10000	~10000	0	0	0	0	0	0	0
509	18 September	Off	4	3	12:47:22	12:50:33	S	60	1	~10000	~10000	0	0	0	0	0	0	0
510	18 September	Off	4	4	12:50:33	12:53:37	S	60	1	~10000	~10000	0	0	0	0	0	0	0
511	18 September	Off	4	5	12:53:37	12:56:55	S	60	1	~10000	~10000	0	0	0	0	0	0	0
512	18 September	Off	4	6	12:56:55	12:59:43	S	60	1	~10000	~10000	0	0	0	0	0	0	0
513	18 September	Off	3	6	13:01:26	13:05:06	S	60	1	~10000	~10000	0	0	0	0	0	0	0
514	18 September	Off	3	5	13:05:06	13:08:39	S	60	1	~10000	~10000	0	0	0	0	0	0	0
515	18 September	Off	3	4	13:08:39	13:12:15	S	60	1	~10000	~10000	0	0	0	0	0	0	0
516	18 September	Off	3	3	13:12:15	13:15:53	S	60	1	~10000	~10000	0	0	0	0	0	0	0
517	18 September	Off	3	2	13:15:53	13:19:26	S	60	1	~10000	~10000	0	0	0	0	0	0	0
518	18 September	Off	3	1	13:19:26	13:22:57	S	60	1	~10000	~10000	0	0	0	0	0	0	0
519	18 September	Off	2	1	13:25:57	13:28:57	S	60	1	~10000	~10000	0	0	0	0	0	0	0
520	18 September	Off	1	2	13:28:57	13:32:11	S	60	1	~10000	~10000	0	0	0	0	0	0	0
521	18 September	Off	1	3	13:32:11	13:35:28	S	60	1	~10000	~10000	0	0	0	0	0	0	0
522	18 September	Off	1	4	13:35:28	13:38:33	S	60	1	~10000	~10000	0	0	0	0	0	0	0
523	18 September	Off	1	5	13:38:33	13:41:58	S	60	1	~10000	~10000	0	0	0	0	0	0	0
524	18 September	Off	1	6	13:41:58	13:44:56	S	60	1	~10000	~10000	0	0	0	0	0	0	0
525	18 September	Int	1	1	13:55:06	14:01:23	S	80	2	~10000	~10000	0	0	0	0	0	0	0
526	18 September	Int	1	2	14:01:23	14:06:44	S	80	2	~10000	~10000	0	0	0	0	0	0	0
527	18 September	Int	1	3	14:06:44	14:12:44	S	100	2	~10000	~10000	0	0	0	0	0	0	0
528	18 September	Int	1	4	14:12:44	14:17:51	S	100	2	~10000	~10000	0	0	0	0	0	0	0
529	18 September	Int	1	5	14:17:51	14:24:17	S	100	2	~10000	~10000	0	0	0	0	0	0	0
530	18 September	Int	4	5	15:30:15	15:37:42	SW	100	2	~10000	~10000	0	0	0	0	0	0	0
531	18 September	Int	4	4	15:37:42	15:43:44	SW	80	2	~10000	~10000	0	0	0	0	0	0	0
532	18 September	Int	4	3	15:43:44	15:50:37	SW	80	2	~10000	~10000	0	0	0	0	0	0	0
533	18 September	Int	4	2	15:50:37	15:56:53	SW	80	3	~10000	~10000	0	1	1	1	0	0	0
534	18 September	Int	4	1	15:56:53	16:04:06	SW	80	3	~10000	~10000	0	1	1	1	0	0	0
535	18 September	Int	2	1	16:06:09	16:12:08	SW	100	2	~10000	~10000	0	0	0	0	0	0	0

Case ID	Date	Survey Type	Line	Block	Time start	Time end	Wind Direction	Overcast (%)	Sea state (0-4)	Visibility left, m	Visibility right, m	Glare Left	Glare Right	White caps Left	White caps Right	Fog Left	Fog Right	Ice
536	18 September	Int	2	2	16:12:08	16:17:30	SW	100	2	~10000	~10000	0	0	0	0	0	0	0
537	18 September	Int	2	3	16:17:30	16:23:37	SW	100	2	~10000	~10000	0	0	0	0	0	0	0
538	18 September	Int	2	4	16:23:37	16:28:33	SW	100	1	~10000	~10000	0	0	0	0	0	0	0
539	18 September	Int	2	5	16:28:33	16:35:06	SW	100	1	~10000	~10000	0	0	0	0	0	0	0
540	18 September	Int	3	6	16:36:50	16:44:02	SW	100	2	~10000	~10000	0	0	0	0	0	0	0
541	18 September	Int	3	5	16:44:02	16:49:39	SW	100	2	~10000	~10000	0	0	0	0	0	0	0
542	18 September	Int	3	4	16:49:39	16:56:24	SW	100	2	~10000	~10000	0	0	0	0	0	0	0
543	18 September	Int	3	3	16:56:24	17:02:37	SW	100	2	~10000	~10000	0	0	0	0	0	0	0
544	18 September	Int	3	2	17:02:37	17:09:43	SW	100	2	~10000	~10000	0	0	0	0	0	0	0
545	18 September	Int	1	1	17:11:55	17:18:25	SW	100	2	~10000	~10000	0	0	0	0	0	0	0
546	18 September	Int	1	2	17:18:25	17:23:59	SW	100	2	~10000	~10000	0	0	0	0	0	0	0
547	18 September	Int	1	3	17:23:59	17:30:20	SW	100	2	~10000	~10000	0	0	0	0	0	0	0
548	18 September	Int	1	4	17:30:20	17:35:46	SW	100	1	~10000	~10000	0	0	0	0	0	0	0
549	18 September	Int	1	5	17:35:46	17:42:26	SW	100	1	~10000	~10000	0	0	0	0	0	0	0
550	19 September	Int	2	5	9:36:34	9:42:52	S	100	2	~10000	~10000	0	0	0	0	0	0	0
551	19 September	Int	2	4	9:42:52	9:48:29	S	100	1	~10000	~10000	0	0	0	0	0	0	0
552	19 September	Int	2	3	9:48:29	9:55:12	S	100	1	~10000	~10000	0	0	0	0	0	0	0
553	19 September	Int	2	2	9:55:12	10:01:17	S	80	1	~10000	~10000	0	0	0	0	0	0	0
554	19 September	Int	2	1	10:01:17	10:08:23	S	80	1	~10000	~10000	0	0	0	0	0	0	0
555	19 September	Off	6	6	10:20:36	10:24:00	S	0	2	~10000	~10000	1	0	0	0	0	0	0
556	19 September	Off	6	5	10:24:00	10:27:35	S	0	2	~10000	~10000	1	0	0	0	0	0	0
557	19 September	Off	6	4	10:27:35	10:31:11	S	0	1	~10000	~10000	1	0	0	0	0	0	0
558	19 September	Off	6	3	10:31:11		S	0	1	~10000	~10000	1	0	0	0	0	0	0
559	19 September	Off	6	2		10:38:23	S	0	1	~10000	~10000	1	0	0	0	0	0	0
560	19 September	Off	6	1	10:38:23	10:41:53	S	0	1	~10000	~10000	1	0	0	0	0	0	0
561	19 September	Lun	1	5	10:49:56	10:56:02	S	0	1	~10000	~10000	1	0	0	0	0	0	0
562	19 September	Lun	1	4	10:56:02	11:02:26	S	0	1	~10000	~10000	1	0	0	0	0	0	0
563	19 September	Lun	1	3	11:02:26	11:08:47	S	30	1	~10000	~10000	1	0	0	0	0	0	0
564	19 September	Lun	1	2	11:08:47	11:15:02	S	30	1	~10000	~10000	1	0	0	0	0	0	0
565	19 September	Lun	1	1	11:15:02	11:21:37	S	50	0.5	~10000	~10000	0	0	0	0	0	0	0
566	19 September	Lun	3	1	11:23:33	11:30:08	S	50	0.5	~10000	~10000	0	0	0	0	0	0	0
567	19 September	Lun	3	2	11:30:08	11:36:24	S	50	0.5	~10000	~10000	0	0	0	0	0	0	0
568	19 September	Lun	3	3	11:36:24	11:42:52	S	50	0.5	~10000	~10000	0	0	0	0	0	0	0
569	19 September	Lun	3	4	11:42:52	11:49:17	S	50	1	~10000	~10000	0	0	0	0	0	0	0
570	19 September	Lun	3	5	11:49:17	11:55:24	S	50	1	~10000	~10000	0	0	0	0	0	0	0
571	19 September	Lun	5	5	11:57:17	12:03:09	S	50	1	~10000	~10000	0	0	0	0	0	0	0
572	19 September	Lun	5	4	12:03:09	12:09:54	S	50	1	~10000	~10000	0	0	0	0	0	0	0
573	19 September	Lun	5	3	12:09:54	12:15:54	S	50	1	~10000	~10000	0	0	0	0	0	0	0
574	19 September	Lun	5	2	12:15:54	12:22:10	S	40	0.5	~10000	~10000	0	0	0	0	0	0	0
575	19 September	Lun	5	1	12:22:10	12:28:33	S	80	0.5	~10000	~10000	0	0	0	0	0	0	0
576	19 September	Lun	7	1	12:30:16	12:36:35	S	80	0.5	~10000	~10000	0	0	0	0	0	0	0
577	19 September	Lun	7	2	12:36:35	12:42:43	S	80	0.5	~10000	~10000	0	0	0	0	0	0	0
578	19 September	Lun	7	3	12:42:43	12:48:50	S	20	0.5	~10000	~10000	0	0	0	0	0	0	0
579	19 September	Lun	7	4	12:48:50	12:55:00	S	20	1	~10000	~10000	0	0	0	0	0	0	0
580	19 September	Lun	7	5	12:55:00	13:01:37	S	20	1	~10000	~10000	0	0	0	0	0	0	0
581	19 September	Int	1	1	13:27:11	13:33:37	S	50	1	~10000	~10000	0	0	0	0	0	0	0
582	19 September	Int	1	2	13:33:37	13:39:33	S	50	1	~10000	~10000	0	0	0	0	0	0	0
583	19 September	Int	1	3	13:39:33	13:45:23	S	50	1	~10000	~10000	0	0	0	0	0	0	0
584	19 September	Int	1	4	13:45:23	13:50:46	S	50	1	~10000	~10000	0	0	0	0	0	0	0
585	19 September	Int	1	5	13:50:46	13:57:42	S	50	1	~10000	~10000	0	0	0	0	0	0	0
586	19 September	Int	1	1	14:53:35		S	100	1	~10000	~10000	0	0	0	0	0	0	0
587	19 September	Int	1	2		15:04:52	S	100	1	~10000	~10000	0	0	0	0	0	0	0
588	19 September	Int	1	3	15:04:52	15:11:15	S	100	1	~10000	~10000	0	0	0	0	0	0	0
589	19 September	Int	1	4	15:11:15	15:17:14	S	100	1	~10000	~10000	0	0	0	0	0	0	0

Case ID	Date	Survey Type	Line	Block	Time start	Time end	Wind Direction	Overcast (%)	Sea state (0-4)	Visibility left, m	Visibility right, m	Glare Left	Glare Right	White caps Left	White caps Right	Fog Left	Fog Right	Ice
590	19 September	Int	1	5	15:17:14	15:24:00	S	100	1	~10000	~10000	0	0	0	0	0	0	0
591	19 September	Off	7	6	15:35:22	15:38:52	S	50	2	~10000	~10000	0	0	0	0	0	0	0
592	19 September	Off	7	5	15:38:52	15:42:28	S	50	2	~10000	~10000	0	0	0	0	0	0	0
593	19 September	Off	7	4	15:42:28	15:46:07	S	50	2	~10000	~10000	0	0	0	0	0	0	0
594	19 September	Off	7	3	15:46:07	15:49:41	S	50	1	~10000	~10000	0	1	0	0	0	0	0
595	19 September	Off	7	2	15:49:41	15:53:33	S	50	1	~10000	~10000	0	1	0	0	0	0	0
596	19 September	Off	7	1	15:53:33	15:57:11	S	50	1	~10000	~10000	0	1	0	0	0	0	0
597	19 September	Lun	9	5	16:03:14	16:09:25	S	50	1	~10000	~10000	0	0	0	0	0	0	0
598	19 September	Lun	9	4	16:09:25	16:15:44	S	80	1	~10000	~10000	0	0	0	0	0	0	0
599	19 September	Lun	9	3	16:15:44	16:22:10	S	80	1	~10000	~10000	0	0	0	0	0	0	0
600	19 September	Lun	9	2	16:22:10	16:28:32	S	80	1	~10000	~10000	0	0	0	0	0	0	0
601	19 September	Lun	9	1	16:28:32	16:35:09	S	80	1	~10000	~10000	0	0	0	0	0	0	0
602	19 September	Lun	11	1	16:37:17	16:43:17	S	100	0.5	~10000	~10000	0	0	0	0	0	0	0
603	19 September	Lun	11	2	16:43:17	16:49:26	S	100	0.5	~10000	~10000	0	0	0	0	0	0	0
604	19 September	Lun	11	3	16:49:26	16:55:21	S	50	1	~10000	~10000	1	0	0	0	0	0	0
605	19 September	Lun	11	4	16:55:21	17:01:37	S	50	1	~10000	~10000	0	0	0	0	0	0	0
606	19 September	Lun	11	5	17:01:37	17:07:43	S	80	1	~10000	~10000	0	0	0	0	0	0	0
607	19 September	Off	4	1	17:11:22	17:19:29	S	80	0.5	~10000	~10000	0	0	0	0	0	0	0
608	19 September	Off	4	2	17:19:29	17:17:37	S	80	0.5	~10000	~10000	0	0	0	0	0	0	0
609	19 September	Off	4	3	17:17:37	17:20:44	S	80	0.5	~10000	~10000	0	0	0	0	0	0	0
610	19 September	Off	4	4	17:20:44	17:23:56	S	60	0.5	~10000	~10000	0	0	0	0	0	0	0
611	19 September	Off	4	5	17:23:56	17:27:07	S	60	0.5	~10000	~10000	0	0	0	0	0	0	0
612	19 September	Off	4	6	17:27:07	17:30:09	S	60	0.5	~10000	~10000	0	0	0	0	0	0	0
613	19 September	Int	2	1	17:39:06	17:44:57	S	60	0.5	~10000	~10000	0	0	0	0	0	0	0
614	19 September	Int	2	2	17:44:57	17:50:35	S	50	0.5	~10000	~10000	0	0	0	0	0	0	0
615	19 September	Int	2	3	17:50:35	17:56:57	S	50	0.5	~10000	~10000	0	0	0	0	0	0	0
616	19 September	Int	2	4	17:56:57	18:01:54	S	50	0.5	~10000	~10000	0	0	0	0	0	0	0
617	19 September	Int	2	5	18:01:54	18:08:11	S	50	0.5	~10000	~10000	0	0	0	0	0	0	0
618	20 September	Int	2	5	9:43:34	9:49:27	W	80	2	~10000	~10000	1	0	0	0	0	0	0
619	20 September	Int	2	4	9:49:27	9:54:27	W	80	2	~10000	~10000	1	0	0	0	0	0	0
620	20 September	Int	2	3	9:54:27	10:00:26	W	10	2	~10000	~10000	1	0	0	0	0	0	0
621	20 September	Int	2	2	10:00:26	10:05:51	W	10	2	~10000	~10000	0	0	0	0	0	0	0
622	20 September	Int	2	1	10:05:51	10:11:46	W	10	2	~10000	~10000	0	0	0	0	0	0	0
623	20 September	Ext	1	1	10:58:19	11:02:45	W	80	2	~10000	~10000	0	0	0	0	0	0	0
624	20 September	Ext	1	1	11:02:45	11:26:40	W	80	3	~10000	~10000	0	0	1	1	0	0	0
625	20 September	Ext	2	2	11:14:20	11:23:27	W	80	3	~10000	~10000	0	0	1	1	0	0	0
626	20 September	Ext	2	2	11:23:27	11:26:40	W	80	2	~10000	~10000	0	0	0	0	0	0	0
627	20 September	Ext	3	3	11:32:36	11:41:11	W	80	2	~10000	~10000	0	0	0	0	0	0	0
628	20 September	Ext	3	3	11:41:11	11:44:05	W	80	3	~10000	~10000	0	0	1	1	0	0	0
629	20 September	Ext	4	4	11:48:00	11:55:30	W	80	3	~10000	~10000	0	0	1	1	0	0	0
630	20 September	Ext	4	4	11:55:30	12:02:25	W	80	2	~10000	~10000	0	0	0	0	0	0	0
631	20 September	Ext	5	5	12:06:07	12:14:00	W	80	2	~10000	~10000	0	0	0	0	0	0	0
632	20 September	Ext	5	5	12:14:00	12:17:30	W	80	3	~10000	~10000	0	1	0	0	0	0	0
633	20 September	Ext	6	6	12:21:15	12:24:57	W	80	3	~10000	~10000	0	0	1	1	0	0	0
634	20 September	Ext	6	6	12:24:57	12:35:28	W	80	3	~10000	~10000	0	0	1	1	0	0	0
635	20 September	Off	6	1	12:48:51	12:51:55	W	50	0.5	~10000	~10000	0	0	0	0	0	0	0
636	20 September	Off	6	2	12:51:55	12:55:18	W	50	0.5	~10000	~10000	0	0	0	0	0	0	0
637	20 September	Off	6	3	12:55:18	12:58:40	W	50	0.5	~10000	~10000	0	0	0	0	0	0	0
638	20 September	Off	6	4	12:58:40	13:02:05	W	50	1	~10000	~10000	0	0	0	0	0	0	0
639	20 September	Off	6	5	13:02:05	13:05:29	W	50	2	~10000	~10000	0	0	0	0	0	0	0
640	20 September	Off	6	6	13:05:29	13:08:52	W	50	2	~10000	~10000	0	0	0	0	0	0	0
641	20 September	Int	1	1	13:20:03	13:27:21	W	100	1	~10000	~10000	0	0	0	0	0	0	0
642	20 September	Int	1	2	13:27:21	13:33:43	W	100	2	~10000	~10000	0	0	0	0	0	0	0
643	20 September	Int	1	3	13:33:43	13:40:03	W	100	2	~10000	~10000	0	0	0	0	0	0	0

Case ID	Date	Survey Type	Line	Block	Time start	Time end	Wind Direction	Overcast (%)	Sea state (0-4)	Visibility left, m	Visibility right, m	Glare Left	Glare Right	White caps Left	White caps Right	Fog Left	Fog Right	Ice
644	20 September	Int	1	4	13:40:03	13:45:17	W	100	3	~10000	~10000	0	0	1	1	0	0	0
645	20 September	Int	1	5	13:45:17		W	100	3	~10000	~10000	0	0	1	1	0	0	0
646	20 September	Int	2	5	14:44:36	14:50:05	NW	80	3	~10000	~10000	0	0	1	1	0	0	0
647	20 September	Int	2	4	14:50:05		NW	80	4	~10000	~10000	0	0	2	2	0	0	0
648	20 September	Int	2	3		14:59:53	NW	80	4	~10000	~10000	0	0	2	2	0	0	0
649	20 September	Int	2	2	14:59:53	15:04:25	NW	80	4	~10000	~10000	0	0	2	2	0	0	0
650	20 September	Int	2	1	15:04:25	15:09:59	NW	80	3	~10000	~10000	0	0	1	1	0	0	0
651	20 September	Ext	7	7	15:41:55	15:53:35	NW	80	3	~10000	~10000	0	0	1	1	0	0	0
652	20 September	Ext	8	8	15:57:20	16:07:49	NW	60	3	~10000	~10000	1	0	1	1	0	0	0
653	20 September	Ext	8	8	16:07:49	16:12:22	NW	60	2	~10000	~10000	1	0	0	0	0	0	0
654	20 September	Ext	9	9	16:16:41	16:27:50	NW	80	2	~10000	~10000	0	0	0	0	0	0	0
655	20 September	Ext	10	10	16:31:44	16:46:21	NW	80	2	~10000	~10000	0	0	0	0	0	0	0
656	20 September	Ext	11	11	16:50:02	17:03:33	NW	80	2	~10000	~10000	0	0	0	0	0	0	0
657	20 September	Ext	12	12	17:07:40	17:22:46	NW	80	1	~10000	~10000	0	0	0	0	0	0	0
658	20 September	Int	1	1	17:44:33	17:50:44	NW	50	2	~10000	~10000	0	0	0	0	0	0	0
659	20 September	Int	1	2	17:50:44	17:56:16	NW	50	2	~10000	~10000	0	0	0	0	0	0	0
660	20 September	Int	1	3	17:56:16	18:02:11	NW	50	3	~10000	~10000	0	0	1	1	0	0	0
661	20 September	Int	1	4	18:02:11	18:07:52	NW	50	2	~10000	~10000	0	0	0	0	0	0	0
662	20 September	Int	1	5	18:07:52	18:14:05	NW	50	2	~10000	~10000	0	0	0	0	0	0	0
663	21 September	Int	2	5	9:30:09	9:35:52	NW	40	2	~10000	~10000	1	0	0	0	0	0	0
664	21 September	Int	2	4	9:35:52	9:40:19	NW	40	2	~10000	~10000	1	0	0	0	0	0	0
665	21 September	Int	2	3	9:40:19	9:45:49	NW	40	3	~10000	~10000	1	0	1	1	0	0	0
666	21 September	Int	2	2	9:45:49	9:50:50	NW	40	2	~10000	~10000	1	0	0	0	0	0	0
667	21 September	Int	2	1	9:50:50	9:56:21	NW	40	2	~10000	~10000	1	0	0	0	0	0	0
668	21 September	Ext	13	13	10:15:55	10:22:44	NW	60	2	~10000	~10000	0	1	0	0	0	0	0
669	21 September	Ext	13	13	10:22:44	10:29:17	NW	60	3	~10000	~10000	0	1	1	1	0	0	0
670	21 September	Ext	14	14	10:33:51	10:44:33	NW	60	4	~10000	~10000	0	0	2	2	0	0	0
671	21 September	Ext	14	14	10:44:33	10:50:12	NW	60	2	~10000	~10000	0	0	0	0	0	0	0
672	21 September	Ext	15	15	10:54:22	10:59:51	NW	60	2	~10000	~10000	0	1	0	0	0	0	0
673	21 September	Ext	15	15	10:59:51	11:06:57	NW	60	4	~10000	~10000	0	1	2	2	0	0	0
674	21 September	Ext	16	16	11:11:09	11:18:00	NW	20	4	~10000	~10000	0	0	2	2	0	0	0
675	21 September	Ext	16	16	11:18:00	11:27:00	NW	20	2	~10000	~10000	0	0	0	0	0	0	0
676	21 September	Ext	17	17	11:30:38	11:40:34	NW	50	2	~10000	~10000	0	1	0	0	0	0	0
677	21 September	Ext	17	17	11:40:34	11:42:27	NW	20	4	~10000	~10000	0	1	2	2	0	0	0
678	21 September	Ext	18	18	11:41:11	11:52:31	NW	20	4	~10000	~10000	0	0	2	2	0	0	0
679	21 September	Ext	18	18	11:52:31	11:59:36	NW	50	2	~10000	~10000	0	0	0	0	0	0	0
680	21 September	Ext	19	19	12:03:07	12:09:31	NW	50	2	~10000	~10000	0	1	0	0	0	0	0
681	21 September	Ext	19	19	12:09:31	12:14:22	NW	20	3	~10000	~10000	0	1	1	1	0	0	0
682	21 September	Ext	20	20	12:18:11	12:26:55	NW	20	3	~10000	~10000	0	0	1	1	0	0	0
683	21 September	Ext	20	20	12:26:55	12:32:09	NW	20	4	~10000	~10000	0	0	2	2	0	0	0
684	21 September	Ext	21	21	12:36:06	12:39:11	NW	50	2	~10000	~10000	0	0	0	0	0	0	0
685	21 September	Ext	21	21	12:39:11	12:47:26	NW	50	2	~10000	~10000	0	1	0	0	0	0	0
686	21 September	Ext	22	22	12:51:27	13:02:00	NW	50	2	~10000	~10000	1	0	0	0	0	0	0
687	21 September	Ext	22	22	13:02:00	13:05:26	NW	50	2	~10000	~10000	0	0	0	0	0	0	0
688	21 September	Int	1	3	13:11:03	13:17:31	NW	50	2	~10000	~10000	0	0	0	0	0	0	0
689	21 September	Int	1	4	13:17:31	13:22:52	NW	50	2	~10000	~10000	0	0	0	0	0	0	0
690	21 September	Int	1	5	13:22:52	13:29:44	NW	50	2	~10000	~10000	0	0	0	0	0	0	0
691	22 September	Int	2	5	11:06:23	11:12:09	NW	0	3	~10000	~10000	1	0	1	1	0	0	0
692	22 September	Int	2	4	11:12:09	11:17:02	NW	0	3	~10000	~10000	1	0	1	1	0	0	0
693	22 September	Int	2	3	11:17:02	11:23:00	NW	0	3	~10000	~10000	1	0	1	1	0	0	0
694	22 September	Ext	23	23	11:25:15	11:27:44	NW	0	2	~10000	~10000	0	1	0	0	0	0	0
695	22 September	Ext	23	23	11:27:44	11:36:13	NW	0	3	~10000	~10000	0	1	1	1	0	0	0
696	22 September	Ext	24	24	11:32:48	12:03:33	NW	0	3	~10000	~10000	1	0	1	1	0	0	0
697	22 September	Ext	24	24	12:03:33	11:55:25	NW	0	2	~10000	~10000	1	0	0	0	0	0	0

Case ID	Date	Survey Type	Line	Block	Time start	Time end	Wind Direction	Overcast (%)	Sea state (0-4)	Visibility left, m	Visibility right, m	Glare Left	Glare Right	White caps Left	White caps Right	Fog Left	Fog Right	Ice
698	22 September	Ext	25	25	11:58:55	12:02:33	NW	0	2	~10000	~10000	0	1	0	0	0	0	0
699	22 September	Ext	25	25	12:02:33	12:09:36	NW	0	3	~10000	~10000	0	1	1	1	0	0	0
700	22 September	Ext	26	26	12:13:09	12:24:11	NW	0	3	~10000	~10000	1	0	1	1	0	0	0
701	22 September	Ext	26	26	12:24:11	12:29:08	NW	0	2	~10000	~10000	1	0	0	0	0	0	0
702	22 September	Ext	27	27	12:32:57	12:36:44	NW	0	2	~10000	~10000	0	1	0	0	0	0	0
703	22 September	Ext	27	27	12:36:44	12:43:17	NW	0	3	~10000	~10000	0	1	1	1	0	0	0
704	22 September	Ext	27	27	12:47:12	12:58:33	NW	0	3	~10000	~10000	1	0	1	1	0	0	0
705	22 September	Ext	28	28	12:58:33	13:03:25	NW	0	2	~10000	~10000	1	0	0	0	0	0	0
706	22 September	Ext	28	28	13:07:13	13:10:33	NW	0	2	~10000	~10000	0	1	0	0	0	0	0
707	22 September	Ext	29	29	13:10:33	13:18:31	NW	0	3	~10000	~10000	0	1	1	1	0	0	0
708	22 September	Ext	29	29	13:22:44	13:40:22	NW	0	3	~10000	~10000	1	0	1	1	0	0	0
709	22 September	Ext	30	30	13:40:22	13:41:55	NW	0	2	~10000	~10000	1	0	0	0	0	0	0
710	22 September	Ext	30	30	13:45:38	13:51:11	NW	0	3	~10000	~10000	0	1	1	1	0	0	0
711	22 September	Ext	31	31	13:51:11	13:57:27	NW	0	4	~10000	~10000	0	1	2	2	0	0	0
712	22 September	Ext	31	31	14:00:49	14:12:44	NW	0	4	~10000	~10000	1	0	2	2	0	0	0
713	22 September	Ext	32	32	14:12:44	14:19:41	NW	0	3	~10000	~10000	1	0	1	1	0	0	0
714	22 September	Ext	32	32	14:23:34	14:31:00	NW	0	3	~10000	~10000	0	1	1	1	0	0	0
715	22 September	Ext	33	33	14:31:00	14:35:15	NW	0	4	~10000	~10000	0	1	2	2	0	0	0
716	22 September	Ext	34	34	14:39:14	14:52:55	NW	0	2	~10000	~10000	1	0	0	0	0	0	0
717	22 September	Ext	34	34	14:52:55	14:55:48	NW	0	3	~10000	~10000	1	0	1	1	0	0	0
718	21 October	Int	2	5	10:02:00	10:08:12	NE	0	1	~10000	~10000	1	0	0	0	0	0	0
719	21 October	Int	2	4	10:08:12	10:13:02	NE	0	1	~10000	~10000	1	0	0	0	0	0	0
720	21 October	Int	2	3	10:13:02	10:18:46	NE	0	1	~10000	~10000	1	0	0	0	0	0	0
721	21 October	Int	2	2	10:18:46	10:24:10	NE	0	1	~10000	~10000	1	0	0	0	0	0	0
722	21 October	Int	2	1	10:24:10	10:30:26	NE	0	1	~10000	~10000	1	0	0	0	0	0	0
723	21 October	Lun	1	5	11:02:02	11:08:00	SW	0	1	~10000	~10000	1	0	0	0	0	0	0
724	21 October	Lun	1	4	11:08:00	11:13:50	SW	0	1	~10000	~10000	1	0	0	0	0	0	0
725	21 October	Lun	1	3	11:13:50	11:19:33	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
726	21 October	Lun	1	2	11:19:33	11:25:09	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
727	21 October	Lun	1	1	11:25:09	11:30:31	SW	0	2	~10000	~10000	1	0	0	0	0	0	0
728	21 October	Lun	3	1	11:32:12	11:37:28	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
729	21 October	Lun	3	2	11:37:28	11:42:28	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
730	21 October	Lun	3	3	11:42:28	11:47:42	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
731	21 October	Lun	3	4	11:47:42	11:53:08	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
732	21 October	Lun	3	5	11:53:08	11:58:22	SW	0	1	~10000	~10000	0	0	0	0	0	0	0
733	21 October	Lun	5	5	12:00:21	12:06:13	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
734	21 October	Lun	5	4	12:06:13	12:12:14	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
735	21 October	Lun	5	3	12:12:14	12:18:11	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
736	21 October	Lun	5	2	12:18:11	12:24:05	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
737	21 October	Lun	5	1	12:24:05	12:29:54	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
738	21 October	Lun	7	1	12:31:48	12:37:15	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
739	21 October	Lun	7	2	12:37:15	12:42:30	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
740	21 October	Lun	7	3	12:42:30	12:47:38	SW	0	3	~10000	~10000	1	1	1	1	0	0	0
741	21 October	Lun	7	4	12:47:38	12:52:53	SW	0	3	~10000	~10000	1	1	1	1	0	0	0
742	21 October	Lun	7	5	12:52:53	12:55:44	SW	0	3	~10000	~10000	1	1	1	1	0	0	0
743	21 October	Lun	7	5	12:55:44	12:58:04	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
744	21 October	Off	1	0	13:05:55	13:08:53	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
745	21 October	Off	1	1	13:08:53	13:11:37	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
746	21 October	Off	1	2	13:11:37	13:14:18	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
747	21 October	Off	1	3	13:14:18	13:16:59	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
748	21 October	Off	1	4	13:16:59	13:19:43	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
749	21 October	Off	1	5	13:19:43	13:22:31	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
750	21 October	Off	1	6	13:22:31	13:25:14	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
751	21 October	Int	1	1	13:33:55	13:38:56	SW	0	3	~10000	~10000	0	0	1	1	0	0	0

Case ID	Date	Survey Type	Line	Block	Time start	Time end	Wind Direction	Overcast (%)	Sea state (0-4)	Visibility left, m	Visibility right, m	Glare Left	Glare Right	White caps Left	White caps Right	Fog Left	Fog Right	Ice
752	21 October	Int	1	2	13:38:56	13:43:28	SW	0	3	~10000	~10000	0	0	1	1	0	0	0
753	21 October	Int	1	3	13:43:28	13:48:37	SW	0	3	~10000	~10000	0	0	1	1	0	0	0
754	21 October	Int	1	4	13:48:37	13:53:00	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
755	21 October	Int	1	5	13:53:00	13:58:21	SW	0	2	~10000	~10000	0	0	0	0	0	0	0
756	21 October	Int	1	5	15:02:32	15:08:42	S	0	2	~10000	~10000	0	1	0	0	0	0	0
757	21 October	Int	1	4	15:08:42	15:13:43	S	0	2	~10000	~10000	0	1	0	0	0	0	0
758	21 October	Int	1	3	15:13:43	15:19:40	S	0	2	~10000	~10000	0	1	0	0	0	0	0
759	21 October	Int	1	2	15:19:40	15:25:11	S	0	4	~10000	~10000	0	1	2	2	0	0	0
760	21 October	Int	1	1	15:25:11	15:31:35	S	0	4	~10000	~10000	0	1	2	2	0	0	0
761	21 October	Off	2	6	15:41:08	15:44:24	SE	20	3	~10000	~10000	0	1	1	1	0	0	0
762	21 October	Off	2	5	15:44:24	15:47:26	SE	20	3	~10000	~10000	0	1	1	1	0	0	0
763	21 October	Off	2	4	15:47:26	15:50:27	SE	20	3	~10000	~10000	0	1	1	1	0	0	0
764	21 October	Off	2	3	15:50:27	15:53:27	SE	20	3	~10000	~10000	0	1	1	1	0	0	0
765	21 October	Off	2	2	15:53:27	15:56:27	SE	20	3	~10000	~10000	0	1	1	1	0	0	0
766	21 October	Off	2	1	15:56:27	15:59:23	SE	20	3	~10000	~10000	0	1	1	1	0	0	0
767	21 October	Lun	9	5	16:09:59	16:12:31	SE	20	3	~10000	~10000	0	1	1	1	0	0	0
768	21 October	Lun	9	4	16:12:31	16:18:26	SE	20	3	~10000	~10000	0	1	1	1	0	0	0
769	21 October	Lun	9	3	16:18:26	16:24:29	SE	20	2	~10000	~10000	0	1	0	0	0	0	0
770	21 October	Lun	9	2	16:24:29	16:30:38	SE	20	2	~10000	~10000	0	1	0	0	0	0	0
771	21 October	Lun	9	1	16:30:38	16:39:27	SE	20	2	~10000	~10000	0	1	0	0	0	0	0
772	21 October	Lun	11	1	16:39:00	16:44:15	SE	0	3	~10000	~10000	0	0	1	1	0	0	0
773	21 October	Lun	11	2	16:44:15	16:49:20	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
774	21 October	Lun	11	3	16:49:20	16:54:14	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
775	21 October	Lun	11	4	16:54:14	16:59:22	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
776	21 October	Lun	11	5	16:59:22	17:04:15	SE	80	3	~10000	~10000	0	0	1	1	0	0	0
777	21 October	Int	3	1	17:08:08	17:10:41	SE	80	3	~10000	~10000	0	0	1	1	0	0	0
778	21 October	Int	3	2	17:10:41	17:13:15	SE	80	3	~10000	~10000	0	0	1	1	0	0	0
779	21 October	Int	3	3	17:13:15	17:15:47	SE	80	3	~10000	~10000	0	0	1	1	0	0	0
780	21 October	Int	3	4	17:15:47	17:18:28	SE	80	3	~10000	~10000	0	0	1	1	0	0	0
781	21 October	Int	3	5	17:18:28	17:21:14	SE	40	4	~10000	~10000	0	0	2	2	0	0	0
782	21 October	Int	2	1	17:21:14	17:23;33	SE	40	4	~10000	~10000	0	0	2	2	0	0	0
783	21 October	Int	2	1	17:32:25	17:37:15	SE	0	4	~10000	~10000	0	0	2	2	0	0	0
784	21 October	Int	2	2	17:37:15	17:41:37	SE	0	4	~10000	~10000	0	0	2	2	0	0	0
785	21 October	Int	2	3	17:41:37	17:46:41	SE	0	4	~10000	~10000	0	0	2	2	0	0	0
786	21 October	Int	2	4	17:46:41	17:50:38	SE	0	4	~10000	~10000	0	0	2	2	0	0	0
787	21 October	Int	2	5	17:50:38	17:56:17	SE	0	4	~10000	~10000	0	0	2	2	0	0	0
788	26 October	Int	1	5	9:51:22	9:56:39	SW	100	2	~10000	~10000	0	0	0	0	0	0	0
789	26 October	Int	1	4	9:56:39	10:01:05	SW	100	2	~10000	~10000	0	0	0	0	0	0	0
790	26 October	Int	1	3	10:01:05	10:06:40	SW	100	2	~10000	~10000	0	0	0	0	0	0	0
791	26 October	Int	1	2	10:06:40	10:11:43	SW	100	2	~10000	~10000	0	0	0	0	0	0	0
792	26 October	Int	1	1	10:11:43	10:16:57	SW	100	1	~10000	~10000	0	0	0	0	0	0	0
793	26 October	Int	2	1	10:19:19	10:25:41	SW	100	1	~10000	~10000	0	0	0	0	0	0	0
794	26 October	Int	2	2	10:25:41	10:31:00	SW	100	1	~10000	~10000	0	0	0	0	0	0	0
795	26 October	Int	2	3	10:31:00	10:36:24	SW	100	1	~10000	~10000	0	0	0	0	0	0	0
796	26 October	Int	2	4	10:36:24	10:40:58	SW	100	1	~10000	~10000	0	0	0	0	0	0	0
797	26 October	Int	2	5	10:40:58	10:46:41	SW	100	1	~10000	~10000	0	0	0	0	0	0	0
798	26 October	Int	3	5	10:48:37	10:53:55	SW	100	1	~10000	~10000	0	0	0	0	0	0	0
799	26 October	Int	3	4	10:53:55	10:58:04	SW	100	1	~10000	~10000	0	0	0	0	0	0	0
800	26 October	Int	3	3	10:58:04	11:03:00	SW	100	1	~10000	~10000	0	0	0	0	0	0	0
801	26 October	Int	3	2	11:03:00	11:07:24	SW	100	1	~10000	~10000	0	0	0	0	0	0	0
802	26 October	Int	3	1	11:07:24	11:12:25	SW	100	1	~10000	~10000	0	0	0	0	0	0	0
803	26 October	Int	4	1	11:14:37	11:21:01	SW	100	2	≤ 1000	≤ 1000	0	0	0	0	0	0	0
804	26 October	Int	4	2	11:21:01	11:26:32	SW	100	2	≤ 1000	≤ 1000	0	0	0	0	0	0	0
805	26 October	Int	4	3	11:26:32	11:32:39	SW	100	1	~10000	~10000	0	0	0	0	0	0	0

Case ID	Date	Survey Type	Line	Block	Time start	Time end	Wind Direction	Overcast (%)	Sea state (0-4)	Visibility left, m	Visibility right, m	Glare Left	Glare Right	White caps Left	White caps Right	Fog Left	Fog Right	Ice
806	26 October	Int	4	4	11:32:39	11:37:33	SW	100	1	~10000	~10000	0	0	0	0	0	0	0
807	26 October	Int	4	5	11:37:33	11:43:59	SW	100	1	~10000	~10000	0	0	0	0	0	0	0
808	28 October	Int	1	5	9:35:18	9:41:51	S	100	3	~10000	~10000	0	0	1	1	0	0	0
809	28 October	Int	1	4	9:41:51	9:47:36	S	100	3	~10000	~10000	0	0	1	1	0	0	0
810	28 October	Int	1	3	9:47:36	9:53:45	S	100	2	~10000	~10000	0	0	0	0	0	0	0
811	28 October	Int	1	2	9:53:45	9:59:37	S	100	3	~10000	~10000	0	0	1	1	0	0	0
812	28 October	Int	1	1	9:59:37	10:06:21	S	100	4	~10000	~10000	0	0	2	2	0	0	0
813	28 October	Off	9	6	10:26:05	10:29:18	S	100	4	~10000	~10000	0	0	2	2	0	0	0
814	28 October	Off	9	5	10:29:18	10:32:31	S	100	4	~10000	~10000	0	0	2	2	0	0	0
815	28 October	Off	9	4	10:32:31	10:35:41	S	100	4	~10000	~10000	0	0	2	2	0	0	0
816	28 October	Off	9	3	10:35:41	10:38:48	S	100	4	~10000	~10000	0	0	2	2	0	0	0
817	28 October	Off	9	2	10:38:48	10:41:58	S	100	4	~10000	~10000	0	0	2	2	0	0	0
818	28 October	Off	9	1	10:41:58	10:45:05	S	100	4	~10000	~10000	0	0	2	2	0	0	0
819	28 October	Off	9	+1	10:45:05	10:48:11	S	100	4	~10000	~10000	0	0	2	2	0	0	0
820	28 October	Off	8	+1	10:49:27	10:51:55	S	100	4	~10000	~10000	0	0	2	2	0	0	0
821	28 October	Off	8	1	10:51:55	10:54:26	S	100	4	~10000	~10000	0	0	2	2	0	0	0
822	28 October	Off	8	2	10:54:26	10:56:55	S	100	4	~10000	~10000	0	0	2	2	0	0	0
823	28 October	Off	8	3	10:56:55	10:59:19	S	100	4	~10000	~10000	0	0	2	2	0	0	0
824	28 October	Off	8	4	10:59:19	11:01:44	S	100	4	~10000	~10000	0	0	2	2	0	0	0
825	28 October	Off	8	5	11:01:44	11:04:08	S	100	4	~10000	~10000	0	0	2	2	0	0	0
826	28 October	Off	8	6	11:04:08	11:06:44	S	100	4	~10000	~10000	0	0	2	2	0	0	0
827	28 October	Off	7	6	11:08:37	11:11:43	S	100	4	~10000	~10000	0	0	2	2	0	0	0
828	28 October	Off	7	5	11:11:43	11:15:11	S	100	4	~10000	~10000	0	0	2	2	0	0	0
829	28 October	Off	7	4	11:15:11	11:18:33	S	100	4	~10000	~10000	0	0	2	2	0	0	0
830	28 October	Off	7	3	11:18:33	11:21:54	S	100	4	~10000	~10000	0	0	2	2	0	0	0
831	28 October	Off	7	2	11:21:54	11:25:17	S	100	4	~10000	~10000	0	0	2	2	0	0	0
832	28 October	Off	7	1	11:25:17	11:28:36	S	100	4	~10000	~10000	0	0	2	2	0	0	0
833	28 October	Off	7	+1	11:28:36	11:31:33	S	100	4	~10000	~10000	0	0	2	2	0	0	0
834	28 October	Off	6	+1	11:33:28	11:35:58	S	100	4	~10000	~10000	0	0	2	2	0	0	0
835	28 October	Off	6	1	11:35:58	11:38:35	S	100	4	~10000	~10000	0	0	2	2	0	0	0
836	28 October	Off	6	2	11:38:35		S	100	4	~10000	~10000	0	0	2	2	0	0	0
837	28 October	Off	6	3		11:43:25	S	100	4	~10000	~10000	0	0	2	2	0	0	0
838	28 October	Off	6	4	11:43:25	11:45:49	S	100	4	~10000	~10000	0	0	2	2	0	0	0
839	28 October	Off	6	5	11:45:49	11:48:15	S	100	4	~10000	~10000	0	0	2	2	0	0	0
840	28 October	Off	6	6	11:48:15	11:50:33	S	100	4	~10000	~10000	0	0	2	2	0	0	0
841	28 October	Int	2	1	12:00:46	12:05:23	S	100	4	~10000	~10000	0	0	2	2	0	0	0
842	28 October	Int	2	2	12:05:23	12:09:22	S	100	4	~10000	~10000	0	0	2	2	0	0	0
843	28 October	Int	2	3	12:09:22	12:13:51	S	100	4	~10000	~10000	0	0	2	2	0	0	0
844	28 October	Int	2	4	12:13:51	12:17:31	S	100	4	~10000	~10000	0	0	2	2	0	0	0
845	28 October	Int	2	5	12:17:31	12:22:11	S	100	4	~10000	~10000	0	0	2	2	0	0	0
846	29 November	Int	3	5	12:07:55	12:13:47	S(2-4M/C)	0	2	~10000	~10000	0	1	0	0	0	0	0
847	29 November	Int	3	4	12:13:47	12:18:51	S	0	2	~10000	~10000	0	1	0	0	0	0	0
848	29 November	Int	3	3	12:18:51	12:23:45	S	0	2	~10000	~10000	0	1	0	0	0	0	0
849	29 November	Int	3	2	12:23:45	12:28:09	S	0	1	~10000	~10000	0	1	0	0	0	0	0
850	29 November	Int	3	1	12:28:09	12:33:27	S	0	1	~10000	~10000	0	1	0	0	0	0	0
851	29 November	Off	9	6	12:47:27	12:30:09	S	100	1	~10000	~10000	0	0	0	0	0	0	0
852	29 November	Off	9	5	12:30:09	12:53:03	S	100	1	~10000	~10000	0	0	0	0	0	0	0
853	29 November	Off	9	4	12:53:03	12:55:47	S	100	1	~10000	~10000	0	0	0	0	0	0	0
854	29 November	Off	9	3	12:55:47	12:58:25	S	100	1	~10000	~10000	0	0	0	0	0	0	0
855	29 November	Off	9	2	12:58:25	13:01:11	S	100	1	~10000	~10000	0	0	0	0	0	0	0
856	29 November	Off	9	1	13:01:11	13:03:59	S	100	1	~10000	~10000	0	0	0	0	0	0	0
857	29 November	Off	9	+1	13:03:59	13:06:45	S	100	1	~10000	~10000	0	0	0	0	0	0	0

Case ID	Date	Survey Type	Line	Block	Time start	Time end	Wind Direction	Overcast (%)	Sea state (0-4)	Visibility left, m	Visibility right, m	Glare Left	Glare Right	White caps Left	White caps Right	Fog Left	Fog Right	Ice
858	29 November	Off	8	+1	13:08:07	13:10:44	S	100	1	~10000	~10000	0	0	0	0	0	0	0
859	29 November	Off	8	1	13:10:44	13:13:24	S	100	1	~10000	~10000	0	0	0	0	0	0	0
860	29 November	Off	8	2	13:13:24	13:16:00	S	100	1	~10000	~10000	0	0	0	0	0	0	0
861	29 November	Off	8	3	13:16:00	13:18:40	S	100	1	~10000	~10000	0	0	0	0	0	0	0
862	29 November	Off	8	4	13:18:40	13:21:33	S	100	1	~10000	~10000	0	0	0	0	0	0	0
863	29 November	Off	8	5	13:21:33	13:24:04	S	100	1	~10000	~10000	0	0	0	0	0	0	0
864	29 November	Off	8	6	13:24:04		S	100	1	~10000	~10000	0	0	0	0	0	0	0
865	29 November	Off	7	6	13:28:40	13:31:15	S	0	1	~10000	~10000	0	1	0	0	0	0	0
866	29 November	Off	7	5	13:31:15	13:34:17	S	0	1	~10000	~10000	0	1	0	0	0	0	0
867	29 November	Off	7	4	13:34:17	13:37:33	S	0	1	~10000	~10000	0	1	0	0	0	0	0
868	29 November	Off	7	3	13:37:33	13:40:36	S	0	1	~10000	~10000	0	1	0	0	0	0	0
869	29 November	Off	7	2	13:40:36	13:43:55	S	0	1	~10000	~10000	0	1	0	0	0	0	0
870	29 November	Off	7	1	13:43:55	13:46:59	S	0	1	~10000	~10000	0	1	0	0	0	0	0
871	29 November	Off	7	+1	13:46:59	13:44:50	S	0	1	~10000	~10000	0	1	0	0	0	0	0
872	29 November	Off	1	+1	13:51:35	13:54:13	S	70	1	~10000	~10000	0	1	0	0	0	0	0
873	29 November	Off	1	1	13:54:13	13:56:47	S	70	1	~10000	~10000	0	1	0	0	0	0	0
874	29 November	Off	1	2	13:56:47	13:59:21	S	70	1	~10000	~10000	0	1	0	0	0	0	0
875	29 November	Off	1	3	13:59:21	14:01:59	S	70	1	~10000	~10000	0	1	0	0	0	0	0
876	29 November	Off	1	4	14:01:59	14:04:44	S	70	1	~10000	~10000	0	1	0	0	0	0	0
877	29 November	Off	1	5	14:04:44	14:07:31	S	70	1	~10000	~10000	0	1	0	0	0	0	0
878	29 November	Off	1	6	14:07:31	14:09:59	S	70	1	~10000	~10000	0	1	0	0	0	0	0
879	2 December	Int	3	5	10:48:48	10:55:00	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
880	2 December	Int	3	4	10:55:00	10:59:55	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
881	2 December	Int	3	3	10:59:55	11:05:35	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
882	2 December	Int	3	2	11:05:35	11:11:44	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
883	2 December	Int	3	1	11:11:44	11:16:39	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
884	2 December	Off	5	6	11:29:23		SE	0	2	~10000	~10000	0	0	0	0	0	0	0
885	2 December	Off	5	5		11:35:24	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
886	2 December	Off	5	4	11:35:24	11:38:36	SE	80	1	~10000	~10000	0	0	0	0	0	0	0
887	2 December	Off	5	3	11:38:36	11:41:46	SE	80	2	~10000	~10000	0	0	0	0	0	0	0
888	2 December	Off	5	2	11:41:46	11:44:52	SE	80	3	~10000	~10000	0	0	1	1	0	0	0
889	2 December	Off	5	1	11:44:52	11:48:05	SE	80	3	~10000	~10000	0	0	1	1	0	0	0
890	2 December	Lun	1	5	11:54:29	11:59:49	SE	0	1	~10000	~10000	0	0	0	0	0	0	0
891	2 December	Lun	1	4	11:59:49	12:06:11	SE	0	1	~10000	~10000	0	0	0	0	0	0	0
892	2 December	Lun	1	3	12:06:11	12:12:17	SE	0	1	~10000	~10000	0	0	0	0	0	0	0
893	2 December	Lun	1	2	12:12:17	12:18:16	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
894	2 December	Lun	1	1	12:18:16	12:24:21	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
895	2 December	Lun	3	1	12:25:53		SE	0	2	~10000	~10000	0	0	0	0	0	0	0
896	2 December	Lun	3	2		12:35:44	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
897	2 December	Lun	3	3	12:35:44	12:40:37	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
898	2 December	Lun	3	4	12:40:37	12:45:44	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
899	2 December	Lun	3	5	12:45:44	12:40:37	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
900	2 December	Lun	5	5	12:52:30	12:58:32	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
901	2 December	Lun	5	4	12:58:32	13:04:23	SE	0	3	~10000	~10000	0	0	1	1	0	0	0
902	2 December	Lun	5	3	13:04:23	13:10:25	SE	0	3	~10000	~10000	0	0	1	1	0	0	0
903	2 December	Lun	5	2	13:10:25	13:16:32	SE	0	2	~10000	~10000	0	0	0	0	0	0	0
904	2 December	Lun	5	1	13:16:32	13:23:31	SE	0	1	~10000	~10000	0	0	0	0	0	0	0
905	2 December	Lun	7	1	13:24:31	13:28:59	SE	100	1	~10000	~10000	0	0	0	0	0	0	0
906	2 December	Lun	7	2	13:28:59	13:33:55	SE	80	1	~10000	~10000	0	0	0	0	0	0	0
907	2 December	Lun	7	3	13:33:55	13:38:59	SE	80	1	~10000	~10000	0	0	0	0	0	0	0
908	2 December	Lun	7	4	13:38:59	13:44:00	SE	80	2	~10000	~10000	0	0	0	0	0	0	0
909	2 December	Lun	7	5	13:44:00	13:49:09	SE	80	2	~10000	~10000	0	0	0	0	0	0	0
910	2 December	Off	4	1	13:54:25		SE	40	1	~10000	~10000	0	0	0	0	0	0	0
911	2 December	Off	4	2		13:59:18	SE	40	1	~10000	~10000	0	0	0	0	0	0	0

Case ID	Date	Survey Type	Line	Block	Time start	Time end	Wind Direction	Overcast (%)	Sea state (0-4)	Visibility left, m	Visibility right, m	Glare Left	Glare Right	White caps Left	White caps Right	Fog Left	Fog Right	Ice
912	2 December	Off	4	3	13:59:18	14:01:51	SE	40	1	~10000	~10000	0	0	0	0	0	0	0
913	2 December	Off	4	4	14:01:51	14:04:29	SE	40	3	~10000	~10000	0	0	1	1	0	0	0
914	2 December	Off	4	5	14:04:29	14:06:51	SE	40	3	~10000	~10000	0	0	1	1	0	0	0
915	2 December	Off	4	6	14:06:51	14:09:29	SE	40	3	~10000	~10000	0	0	1	1	0	0	0
916	2 December	Int	1	1		14:22:33	SE	60	3	~10000	~10000	0	0	1	1	0	0	0
917	2 December	Int	1	2	14:22:33	14:27:29	SE	60	2	~10000	~10000	0	0	0	0	0	0	0
918	2 December	Int	1	3	14:27:29	14:32:15	SE	60	2	~10000	~10000	0	0	0	0	0	0	0
919	2 December	Int	1	4	14:32:15	14:36:24	SE	60	2	~10000	~10000	0	0	0	0	0	0	0
920	2 December	Int	1	5	14:36:24	14:41:49	SE	60	2	~10000	~10000	0	0	0	0	0	0	0